GAS JOURNAL

Vol. 257 **January 19, 1949** **No. 4468**

THE COKE SALES CIRCLE

ALL the old enthusiasm which made the pre-war Coke Sales Circle and the Coke Distributors' Coke Sales Circle so successful was evident at Gas Industry House on Jan. 7 when representatives of producers and distributors in equal numbers launched a new united London and Counties Coke Sales Circle, with a distributor as President, a producer as Chairman, and a distributor as Vice-Chairman, and equal numbers of both sides on the Committee. Nine years have passed since the original Circles were last mentioned in our columns. They held a joint meeting early in 1940, at which Mr. W. L. Boon, then General Manager of the London and Counties Coke Association, spoke on "The Present Coke Position and Post-War Outlook." Times have changed since those seemingly far-off days, when the industry was looking apprehensively forward to a fuel shortage, but even then there was a recognition of common aim, although producers and distributors, so far as sales were concerned, were working in separate compartments. Many of Mr. Boon's hopes have been realized so far as technical progress goes, but not all of the markets have been fully developed, for the simple reason that, nearly four years after the end of the war, coke is still subject to restriction and control despite the building-up of stocks at most gas-works.

The time is approaching when coke, which is at present out of step with other fuels as regards price and can be sold only in restricted quantities, will need "selling"—not merely by salesmen, but by technical representatives qualified to advise consumers on the best fuel to use and the best way to use it. The launching of the London and Counties Coke Sales Circle is the outcome of a determination to re-start as a band of enthusiasts on a flexible basis and let development take place in the light of circumstances as they arise. Membership is open to principals of members of technical, administrative, or coke sales staffs of coke producers and distributors who are members of the London and Counties Coke Association or of the Coke Distributors' Branch. As approved by the inaugural meeting there is no provision for appliance manufacturers to become ordinary members, but close co-operation is definitely contemplated, and it may well be that a suitable class of membership can be devised to give them full recognition.

The inaugural meeting was a crowded one, and there were many written expressions of approval and good wishes for the success of the new Circle ; there was also one criticism—from an Area Board Chairman-designate who was of the opinion that the question of reviving the Circle should have been deferred until after vesting date. There may be very good reasons for avoiding over-organization of the industry in the present state of transition, but coke sales represent a matter of some urgency and we cannot help feeling that on the whole the new administrators of the gas industry will be glad to find a body of coke enthusiasts already organized and ready to fit into the new structure.

JUNIOR ACTIVITIES

AT a time when the future organization of the Junior Gas Associations is under discussion, they go forward cheerfully and with no abatement of enthusiasm, keeping up their activities on the wide range of topics which come before them during the year. Certainly, they ended the old year with flying colours, as the January issue of our contemporary, "GAS," shows. Electricity on gas-works, foundations and means of strengthening them, the production and application of coal water gas, public relations, and works costing—these are some of the topics to which the Juniors turned their attention during December, and their variety in this month's "GAS" forms a cameo of the session's activity of the nine associations.

A paper by Mr. Edward N. Evans, of Lancashire Dynamo and Crypto, Ltd., on the utilization of electrical power with special reference to gas-works installations, is an instance of the liveliness of the Juniors' contributions, and in view of the increasing use of electricity on gas-works is a wide survey which will be greatly appreciated. Mr. Evans considers his subject in logical sequence, first discussing generation, then distribution, and lastly utilization. His remarks on the source of electrical power in gas-works are such as to cause much argument in both the gas and electrical supply industries. Mr. Evans does not believe that one public service should be dependent on another for its power supply, particularly when the British Electricity Authority cannot guarantee a continuous, uninterrupted supply. He favours gas-works running their own generating plant where possible, operating it in parallel with the public supply so that extra power to meet peak loads can be taken from the grid, and so that excess current at times of low demand can be fed into the B.E.A. transmission system. This is a system already being tried in a number of places, but against it there is, of course, the argument that electricity supply engineers generally disfavour parallel operation, believing that they should have all their generating plant under their own control. Mr. Evans's paper then considers the most economical sources of power supply for works generators, the type of current to use, and means of ensuring safe and efficient distribution. Safe distribution is naturally of especial importance in gas-works, where there is likely to be some corrosion. Mr. Evans puts forward an interesting suggestion when he recommends that the task of looking after electrical equipment on gas-works should be in the hands of a qualified electrical engineer. A trained engineer, Mr. Evans agrees, demands a high salary, but he urges that this is a small item when compared with the value of the equipment under his control and the losses likely to arise from an accident or breakdown resulting from an installation of poor design and workmanship.

Mr. Evans's paper is on a secondary aspect of the gas engineer's work, but serves to illustrate the scope of Junior activities. In a more direct line is the paper by Dr. F. W. Lorisch and Mr. A. C. Bureau to a joint meeting of the

Eastern and Western Districts of the Scottish Association on the production and application of coal water gas—a mixture of blue water gas, distillation gas, and oil gas produced from cracked tar vapours. The authors claim that the development of the process of coal water gas manufacture has established a technique of cyclic control in which the sequence of operations and the arrangement of units necessary for optimum efficiency has been fully determined in the course of actual practice. They go on to give details of the plant used in the process, based on that at Plauen in Saxony. The particular process is claimed to have the great advantage that the superheated steam returns to the process a substantial proportion of the heat from the blow gas, giving a higher gasification efficiency than that of other coal water gas processes. Supplementing their remarks, the authors present a long statistical analysis, and conclude that the actual plant results have confirmed the theoretical conclusions.

Turning away from the works side of the industry, we find that recent Junior discussions have given prominence to the sales and administrative side. Mr. Stanley Hopkinson, for instance, presented a lengthy paper on the subject of public relations to the Manchester District Association of Junior Gas Engineers when that body met in Liverpool. As public relations officer of the Liverpool Gas Company and having one of the best organizations in the industry at his command, Mr. Hopkinson was well qualified to speak, and he made his paper a composite of history and good advice. He told, for instance, the story of the formation of the North-West Regional organization of the British Gas Council—to the publicity efforts of which he paid a well-deserved tribute. And most valuable among his remarks, were the tips he gave on how to keep on good terms with the Press.

Also away from the production side of the industry was Mr. C. E. Banham's paper to the Wales and Monmouthshire Juniors on works costing and general administration. Mr. Banham was emphatic about the need for breaking down departmental costs and said that it was now generally acknowledged that an analyzed and dissected cost of gas production was essential if the industry desired to create a production efficiency. His paper was concerned with how this might be done effectively, and he gave some useful information as a guide to the costing of production in its details of coal-handling, labour, purification, crude tar production, and coke and breeze. The author then discussed maintenance and defended himself against the old cry of "making clerks out of workmen" by saying that it took next to no time for a workman to learn to mark his time sheet correctly and thus provide basic information on labour costs for the accountant. That tortuous, complicated subject of depreciation was passed over lightly by the author, as indeed it has to be unless one is writing a separate paper, but with the sources of information he had recommended he showed how the cost of gas into holder could be prepared and give a picture of the true operating efficiency of the works. Again, on this subject of administration, we have a paper from the Western District of the Scottish Association, on income tax in relation to a gas undertaking, which forms an excellent review of the law on this subject.

Yet another aspect of the varied activities of the Junior Association's is covered in a paper to the Northern Association by Mr. W. R. Garrett on the subject of foundations. This speaker pointed out that there was no shortage of literature on the subject of the building of structures, but there was very little reading matter available on that part of a building which goes beneath the ground—one of obvious importance because the whole building's soundness must depend on the quality of its foundations. He proceeded to apply a degree of remedy to this shortage in a lively and detailed paper. The author adopted a sound approach by saying that thousands of buildings bore witness to the fact that experience could assess, within the safe limit, the bearing capacities of various earth strata, but the "real criterion is whether this result could have been achieved with a smaller expenditure of money." He gave a useful general account of means of assessing bearing strength and pointed out many of the snags which the engineer has to meet, including running sand, the presence of water, the possibilities of mining subsidence, the slope of the stratum, &c. He then presented a good deal of practical information on the fascinating topic of pile foundations, the factors governing their choice, and the many types of pile which may be used.

These few examples—the papers will be found printed in full in the January issue of "GAS"—exemplify the vigour and wide range of the Junior Gas Associations. They themselves have made it evident that they will continue this useful activity if they are given the chance by the new régime, and it appears increasingly certain that that chance will be given. The description of the Junior Associations as a university of the gas industry is an old one, but is nevertheless apt. That the university, which has recently been strengthened by the addition of two new centres—the Eastern and the Northern—is in the prime of life is indicated by the summaries which have been given here and by the discussions which followed all these speakers' contributions.

FRESH AIR

The climate may not allow this sort of thing in Britain, but it is pleasant to ponder on the way the Southern California Gas Company of Los Angeles has profited by boosting summer air conditioning by gas. As a result of its effort, the Company was awarded a plaque and a cheque for $1,000 by the American Gas Association. To launch the programme, the Company installed 20 gas air conditioners on its principal display floors. Four units were installed with fans in operation on other display floors, and eight permanently installed units for all-year conditioning of company buildings were displayed. An aggressive advertising campaign was then launched in newspapers, radio, and specialized publications, and exhibitions. During the year, nine general sales promotional meetings were held, and two full-time architectural representatives were employed to boost gas air conditioning continuously with architects. The result of this intensive activity has been an increased summer load for gas even in such a sunny spot as California. The Company has added weight to the slogan of one appliance manufacturer who advertises: "The flame that heats *and* cools."

TROUBLE IN THE GARDEN

The pioneering work of First Garden City, Ltd., the estate development company of Letchworth, Hertfordshire, is well known to those who have interested themselves in town planning. A good deal of the company's success has been due to its electricity and gas undertakings and consequently nationalization is causing the company difficulties. In the year covered by the latest report, the electricity undertaking was taken over for the State, and the gas-works is likely to follow if vesting date comes, as most people expect it to do, this year. The loss of these undertakings, says the acting-chairman in the report, means that "income will be very finely cut." The company's finances, therefore, are having to be rearranged to some extent. Part of the proceeds of electricity compensation were used by the Company to reduce its loan liabilities by £679,200, including the discharge of bank overdrafts and the retirement of some debenture stock. The balance, which has been temporarily invested, is available for redemption of further debenture stock on May 1 next. While making these adjustments, the Company is having to deal with new complexities caused by the Town and Country Planning Act, but it has something to congratulate itself on in that the Minister appears likely to allow the company to complete the development of Letchworth. The adjustments which the Company has had to make are, of course, similar to those which many local authorities will have to consider when they lose the revenue from gas undertakings.

CONSULTATION

Consultation between managers and men in industry is not a headline-making topic, but its worth has been proved many times in getting over minor troubles which might otherwise have been magnified into major disputes. Two publications, one from the

National Coal Board, the other from the Stationery Office, show the importance attached to the subject in official quarters. The N.C.B. *Guide to Consultation* is a little booklet reminiscent of those stuffed into letter-boxes when the National Health Service began, though a little more lavishly produced, and is briefly introduced with a joint statement by the Chairman of the Board, Lord Hyndley, and leaders of workers' associations. Its first section is in the form of a quiz which answers questions on the structure and scope of the consultative committees demanded by the Coal Nationalization Act. Next comes a section giving hints on how joint consultation can be made to work out best in practice, and the booklet concludes with model forms for the constitution and rules of consultative committees at different levels in the coal industry's structure, together with model voting forms. The Stationery Office publication covers a wider field, being a Ministry of Labour report on a conference on joint consultation, training within industry, works information, and personnel management, held in London last September. The booklet gives a full report of the papers and remarks of a large number of distinguished contributors to the conference. While joint consultation is in such demand from the trade union side of industry, this is a booklet that will repay study.

VISUAL EDUCATION

Films made by and about the gas industry have had their sceptics, but the standard of these instructive "shorts," and in particular those made by the British Gas Council, has improved so much that there are now few who doubt their effectiveness. The secret, we believe, lies in regarding the films not as publicity material, but as educational material. Unfortunately, not all the undertakings which utilize these films recognize that distinction which, for all its subtleties, is a matter of common-sense if the films are to be accepted by the educational authorities. The manufacture of the films is only half the battle; they have to be shown to the right people in the right place at the right time. An interesting example of what can be done was witnessed at Croydon on Thursday when many members of the Croydon Teachers' Film Society attended a film show at the main offices of the Gas Company. The success of the function was in no small measure due to the efforts of Mr. R. Hutchinson, Publicity Officer of the Croydon Gas Company, who has built up close contact with the local education authorities, allowing him immediate entry into any school in the area. Mr. D. V. O'Meara, General Manager, occupied the chair, and a welcome was given by Mr. Harold Williams, O.B.E., Deputy-Chairman. The Gas Company, he said, was well able to appreciate the value of visual education, as films and film strips were widely used in their own training centres, and it was a privilege to help educational work in the borough by making available these gas industry films. Mr. Williams went on to remark that during the past year the Company had arranged film shows for 205 audiences, totalling 20,000 people, and it was hoped that these figures would be doubled in the near future. Replying, Mr. H. Roberts, Chief Education Officer and President of the Film Society, said that one irate mother had told him that there was so much psychology used in schools these days, he ought to be in a gas showroom. Many a true word. . . . Joking apart, however, this is the right way to put over our films, treating them as a serious educational medium and seeking the co-operation of those who will appreciate the films' value and are best able to use them.

Personal

Mr. A. S. HOLDEN, F.C.I.S., Assistant Secretary of the South Metropolitan Gas Company, has been appointed Joint Secretary of the Company.

* * *

Mr. R. V. ARNFIELD has resigned from the post of Assistant Engineer, Calor Gas (Distributing) Co., Ltd., and is shortly joining the Ray-Heet Co., Ltd., Leatherhead, in the capacity of Development Engineer.

* * *

Mr. FRED W. TRIBBLE has been appointed technical representative of the Aerograph Co., Ltd., of Lower Sydenham, manufacturers of spray painting equipment and exhaust systems, for South Eastern England. Mr. Tribble has been with the Company for over 20 years.

* * *

Miss ELLINGTON WRIGHT, M.B.E., has been elected Vice-Chairman of the Women's Gas Council Executive Committee in succession to Miss E. WILLIAMS, M.B.E., who has resigned as she is leaving London.

Mr. JAMES R. WALLACE has been appointed as representative of Vanda Meters, Ltd., Nelson, Lancs, in the Midlands and North of England. Mr. Wallace served in the Navy during the war, and his business career till now has been with Alder & Mackay, Ltd., Edinburgh. Mr. Wallace will operate from the Company's Nelson offices.

* * *

Dr. A. B. BADGER, Manager of the Federation of Gas Employers, has been appointed Industrial Relations Officer of the Gas Council. Dr. Badger will continue until Vesting Date his work for the Federation; but the Central Committee of the Federation have agreed to second him to the Gas Council and to grant him any necessary facilities to act in the capacity of its Industrial Relations Officer.

* * *

Lord MCGOWAN, K.B.E., D.C.L., LL.D., Chairman of Imperial Chemical Industries, Ltd., has accepted an invitation to become the first Patron of the Purchasing Officers' Association. Founded in 1931 by the then Controller of Purchases of Imperial Chemical Industries, Ltd., this Association now has a membership of 1,750 purchasing officers in all branches of industry and public administration. With headquarters at 17/18, Henrietta Street, London, W.C.2, the Association has established 21 branches in the principal cities of the country.

* * *

Mr. F. A. JENKINS, A.C.I.S., A.M.Inst.Gas E., Deputy Manager and Engineer to the Leamington Priors Gas Company, retired on Dec. 31 last after 45 years' service. He is a founder member of the Midland Junior Gas Association and was its President in 1936. At the December meeting of the Board, Dr. Harold Mason, J.P., the Chairman, thanked Mr. Jenkins on behalf of the Board for his loyal services and made him a presentation accompanied by the best wishes of the Board. Mr. Jenkins has also been presented with a wrist watch by his colleagues on the staff of the Company. Mr. R. R. H. BURSEY, A.M.I.C.E., Assoc.M.Inst.Gas E., until recently Assistant Works Manager to the North Middlesex Gas Company has been appointed Deputy Engineer. He was Flight Lieutenant in the Civil Engineering Branch of the Royal Air Force and had previously been on the staff of the Leamington Priors Gas Company. Mr. I. S. PRATER, F.C.I.S., becomes Assistant Manager as well as Secretary as from the beginning of this year.

* * *

Retirement of Mr. C. S. Shapley

Mr. C. S. SHAPLEY, Engineer and General Manager of the City of Leeds Gas Department, relinquishes his full-time executive duties in the gas industry on Jan. 23, when he retires after having had charge of the Leeds undertaking for a period of 31 years. Educated at Taplow Grammar School, he served his articles with the Torquay Gas Company, under Mr. R. Beynon, on the expiration of which he was appointed Assistant Engineer of that Company. In 1904 he became Assistant Manager of the Nuneaton Gas Company, and two years later he was appointed Consulting Engineer to Messrs. Schultz and Comins (now Messrs. W. A. Scott & Co.) of 50 Cannon Street, London, E.C., who were at that time proprietors of 16 separate gas undertakings. In 1909 he became Works Manager at the Neepsend Station of the Sheffield and District Gas Company, and in 1915 he was appointed Engineer and Manager of the Southend-on-Sea Gas Company (since absorbed by the Gas Light and Coke Company). Three years later he was appointed to succeed Mr. W. B. Leech at Leeds, and during the 31 years that have elapsed since his appointment the undertaking has experienced almost uninterrupted expansion.

Mr. Shapley was elected President of the Association of Public Lighting Engineers in 1925, and was President of the Manchester District Association of Gas Engineers for two years, 1926-27. In 1929 he received the highest honour his brother gas engineers could bestow upon him in his election as President of the Institution of Gas Engineers. Referred to in the "JOURNAL" as the "Democratic President," he persuaded the Council of the Institution to agree that the office of President should be open to anyone, irrespective of the size of the undertaking represented. In those days the Presidency was available only to officials of undertakings capable of entertaining the Institution; now the Institution funds bear the expenses of the annual meeting. Mr. Shapley's Presidential year—in which the annual meeting was held at Leeds—was also marked by the first Autumn Research Meeting, in the inauguration of which he took a leading part. Many members anticipated that it would be a failure, but the attendance and the

quality of the discussions in the ensuing years have proved the value of such meetings, giving as they do an opportunity for the technical staff to come into the limelight and express their views to the benefit of the industry.

Outside his normal duties Mr. Shapley has served the industry in many ways. He is Deputy Chairman of the Federation of Gas Employers; Chairman of the British Gas Council (Yorks West Riding District); Chairman of the Federation of Gas Employers (Yorks West Riding District); Chairman of the Yorkshire Commercial section of the Manchester District Association of Gas Engineers; Deputy Chairman of the Regional Joint Industrial Council, and Coal Spokesman, No. 3 District Advisory Coal Committee.

GAS BOARD APPOINTMENTS

The Ministry of Fuel and Power has made the following further appointments of members of Area Gas Boards under the Gas Act, 1948.

SCOTTISH

Mr. D. D. MELVIN, Engineer and Manager, Edinburgh Gas Department (full-time). Mr. Melvin was educated at Rutherglen Academy and the Royal Technical College, Glasgow. He received his training at the Dalmarnock works of the Glasgow Corporation Gas Department and subsequently held appointments with the County Council of Lanark at their Uddingston Works, first as Assistant Engineer and Manager and latterly as Manager. He was appointed to the position of Assistant Engineer and Manager at Edinburgh in 1933 and to that of Engineer and Manager in 1947. He is a Past-President of the Scottish Junior Gas Association (Western District) and the Waverley Association.

Mr. J. CAMPBELL, M.B.E., Scottish Regional Gas Officer, Ministry of Fuel and Power. Formerly Engineer and Manager, Dumfirmline Gas Department, which post he occupied for 25 years. Previously he held a similar position at Polmont and Bo'ness. He was President of the North British Association of Gas Managers in 1926. At the request of the Ministry of Fuel and Power Dunfermline Town Council released him to take over the post of Regional Gas Officer for Scotland.

NORTH-WESTERN

Mr. A. HENSHALL (Deputy-Chairman: full time), Commercial Manager and Secretary, Manchester Gas Department.

Mr. E. W. TAME, O.B.E., J.P., Town Clerk, Birkenhead.

Councillor C. E. P. STOTT, member of Manchester City Council.

SOUTH-EASTERN

Mr. TOM BROWN, B.Com., Managing Director, South Suburban Gas Company. Mr. Brown entered the gas industry about 18 years ago. He was appointed Secretary of the South Suburban Gas Company in 1932, General Manager in 1937, and joined the Board of Directors in 1943.

Mr. A. DALGLEISH, formerly National Secretary of the Engineering, Shipbuilding, and Chemical Workers' Union.

Mr. K. W. HICKMAN, Director, Edward de Stein and Co., E.C.2.

Dame VERA LAUGHTON-MATHEWS, D.B.E., Chairman, Domestic Coal Consumers' Council, Chairman, Association of W.R.N.S.

NORTH-EASTERN

Mr. G. H. BAGNALL, Secretary, National Union of Dyers, Bleachers & Textile Workers, Secretary, National Association of Unions in Textile Trade.

Professor A. L. ROBERTS, Ph.D., F.R.I.C., Livesey Professor, Leeds University.

EASTERN

Mr. A. M. BAER, Chairman, M. J. Enthoven & Sons, Ltd., Director, Henry Gardner & Co., Ltd.

Mr. EDWARD C. WOODALL, Chairman, Tottenham and District Gas Company. Mr. Woodall was called to the Bar in 1922, was elected to the Board of the Tottenham and District Gas Company in 1931, and served throughout the war with the British Army, in which he attained the rank of Lieut-Colonel. He was elected Chairman of the Tottenham Company in 1947.

WEST MIDLANDS

Mr. A. W. SMITH, C.B.E., F.C.I.S., formerly General Manager, Birmingham Corporation Gas Department. Mr. Smith, having served all his time with the Birmingham Gas Department, was appointed Secretary to the Department in 1918 after 23 years' service, and became General Manager and Secretary in 1919. He was awarded the C.B.E. in the Birthday Honours List of 1943. He retired in 1944.

Mr. C. G. SPRAGG, O.B.E., Workpeople's Secretary to the Midland Regional Joint Committee for the Building Industry.

The salary of a full-time member of an Area Gas Board is £3,000 per annum and of a part-time member £500 per annum.

The Deputy Chairmen of the Northern, East Midlands, South Eastern, and South Western Boards have not yet been announced.

* * *

Mr. E. M. EDWARDS, who, as reported in last week's issue of the "JOURNAL," has been appointed a whole-time member of the Wales Gas Board, served his apprenticeship to the industry under Mr. W. Clark Jackson at Neath. He left there in 1925 to take up the post of Assistant General Manager to the Holyhead and North Wales Gas and Water Corporation, and remained there until 1928, when he was appointed Engineer and Manager of the Sittingbourne District Gas Company. He left Sittingbourne in July, 1932, to take up his position as Engineer and Manager at Port Talbot.

Obituary

Ex-Bailie ROBERT WATSON, Auchtermuchty, died at his home at Burnside, last week. He was a Director of the Auchtermuchty Gas Company, and a member of the Town Council for many years.

* * *

The death occurred on Jan. 2 of Mr. W. E. HAWTHORNE, who was a Director and Secretary of Cannon Iron Foundries, Ltd. He was 63 years of age and had been with the Company since he left school. His father was Chairman of the Company for many years.

* * *

Mr. A. G. T. ALLEN, Chief Chemist to the Darlington Gas Department, was fatally injured at the works on Jan. 12. Having attended a lecture at the works he had checked the temperatures of a setting of vertical retorts when, descending a fixed iron ladder, he overbalanced and fell a distance of about 18 ft. Mr. Allen, who was 38, had been with the Department for two years. After serving as a chemist with the Nunnery Colliery Co., Ltd., he went abroad with the Anglo-Iranian Oil Co., Ltd., and was for a short time Operating Engineer with the Woodall-Duckham Company.

Letter to the Editor

New Words and Meanings

DEAR SIR,—In to-day's *Times* under the heading "New Words and Meanings" a Special Correspondent writes: "A simple new word that has recently appeared in the Times is 'Conurbation'—meaning 'a cluster of contiguous towns forming one great community'—used in the report issued by the Ministry of Town and Country Planning on the development of the West Midlands."

This very useful word, whose meaning could be extended to describe any large continuously urbanized area, was, however, used in your columns at least 10 years ago in the discussions on the post-war planning of the gas industry which were then going on.

Yours faithfully,

J. J. C. B. B

Jan. 10, 1949.

Diary

Jan. 22.—**Yorkshire Junior Gas Association**: Discussion meeting, Wakefield.

Jan. 25.—**Southern Association of Gas Engineers and Managers (Eastern District)**: "Ten Years' Experience of a Two-part Tariff," J. E. Davis, F.R.I.C., Principal Technical Officer, and R. F. Layton, Tariff Officer, South Metropolitan Gas Company. Gas Industry House, 2.30 p.m.

Jan. 25.—**Wales and Monmouthshire Junior Gas Association**: Visit to the works of the Metal Box Co., Ltd., Neath, 2.30 p.m.

Jan. 26.—**Manchester and District Junior Association of Gas Engineers**: "Some Aspects of Oxide Purification," L. G. Townend, M.Sc., A.R.I.C. (Liverpool).

Jan. 29.—**Western Junior Gas Association**: "Accountancy," G. Sherlock (Torquay), Bridgwater.

Feb. 3.—**Solid Smokeless Fuels Federation**: Executive Committee, 11.30 a.m., Dorchester Hotel, Park Lane, W.1.

Feb. 9.—**London and Southern Junior Gas Association**: "An Industrial and Commercial Gas Sales Organization," T. V. Garrud, A.M.Inst.Gas E. (Gas Light and Coke Company), Gas Industry House, 2.30 p.m.

Feb. 9.—**Scottish Junior Gas Association (Eastern District)**: Visit to the Works of Collvilles, Ltd., Motherwell.

Feb. 11.—**Scottish Junior Gas Association (Western District)**: Short Paper Day.

Feb. 16.—**Manchester District Junior Association of Gas Engineers**: Visit to the works of R. and J. Dempster, Ltd. "Some Aspects of Gas Development." A. J. Leather (Blackburn).

Feb. 19.—**Yorkshire Junior Gas Association**: Paper by B. Thorpe, M.Inst.Gas E., M.Inst.F. (Sheffield), Sheffield.

Feb. 22.—**Wales and Monmouthshire Junior Gas Association**: Visit to New Works, Pontypool.

Feb. 22.—**Midland Junior Gas Association**: Students' meeting. Visit to Coventry Gas Department.

News in Brief

Following an increase in the cost of lead, the Minister of Works has authorized an increase of £11 15s. per ton in the maximum selling prices of lead sheet and pipe. This increase applies to all sales made on and after Jan. 1.

Spalding Gas Committee has authorized Mr. R. C. Arnold, Engineer and Manager, consequent on the substantial increase in gas sales and the condition of the existing plant, to prepare a report for the Ministry of Fuel and Power requesting authority to provide 10 additional retorts before 1956.

The Christmas Spirit was well expressed in a window display at the showrooms of the Rochdale Gas Department. Devised and prepared by a member of the sales staff, the display, picturing Cinderella going to the ball, was built up from ordinary half-inch pipe, two pieces of extended metal, and scraps of cardboard and paper.

Skipton Gas Department completes 50 years of municipal ownership this year. Following a poll at the end of 1898, which showed a majority of 1,403 to 431 in favour of the compulsory purchase, the undertaking was purchased the following year under the powers of the Skipton Urban Council Gas Act passed that year. The gasworks was first established in 1836 by the Skipton Gas Light and Coke Company under a deed of settlement, and afterwards became the property of the Skipton Gas Company, incorporated by Act of Parliament in 1863.

Preference for Gas Cookers was stated in a report of the Housing Committee submitted to the last meeting of the Kidderminster Town Council to have been shown by 79% of the tenants of one of the Council's new housing estates. The Committee recommended that gas appliances should in future be installed in the houses instead of electric cookers. The cost of gas appliances was said to be £21 2s. 6d. (cookers £17 7s. 6d. and boiler £3 15s.) and the cost of electric cookers would be £31 18s. in future, compared with an estimated cost of £26.

A Committee of Experienced Business Men has been set up to advise the Board of Trade on its exhibition policy. Its terms of reference are: to advise the Board of Trade on questions of official participation in, or sponsorship of, exhibitions of trade fairs at home or overseas; to advise the Board on proposals by industry in promoting fairs; and to make suggestions for the co-ordination of national action with regard to trade exhibitions. The 1949 programme of participation in trade exhibitions has had to be drawn up without waiting for the formation of the committee.

Inverness Gas Department had a record output during the past year, producing 355 mill. cu.ft. of gas, an increase over the previous year of 26 mill. cu.ft. The bulk of the increase was due to increased demand from existing consumers, and part of it came from the new houses. Over 21,000 tons of coal was used, an increase of 2,000 tons over 1947. By-products were 10,234 tons of coke, an increase of 1,560 tons, and 330,760 gall. of tar. The output is now 74% greater than it was 10 years ago, and the increase in that time is greater than the entire output of the works in 1930, after 104 years of service to the community.

Scotland's Gas Equipment Industry will have an opportunity to demonstrate its scope at the Scottish Industries Exhibition to be held in the Kelvin Hall, Glasgow, from Sept. 1 to 17. Special attention is being given to the newer light engineering industries, but heavy engineering will be given prominence. Three hundred applications for space have already been received. This show is primarily intended to boost export trade and to interest smaller firms in export. Actual work on the exhibition will begin in August. Minimum space is 100 sq. ft. (against 64 sq. ft. at the B.I.F.). Price will be 12s. 6d. per sq. ft. for normal stands, and skeleton framework will be provided in these stalls at a slight additional cost.

The Industrial Coal Consumers' Council met on Jan. 6 at the Ministry of Fuel and Power. The Council noted that in spite of very good deliveries to the gas-works immediately before Christmas, the N.C.B. is experiencing some difficulty in providing all the gas coal of suitable quality to enable the gas industry to meet the high demand for gas and at the same time to fulfil other commitments for coal of the same character. A close watch is being kept week by week on the gas coal programme. Anthracite, too, is scarce. Industrial and horticultural consumers are therefore having to use coke wherever practicable to eke out the limited deliveries of anthracite. The Council have heard with some relief that the silica brick position is improving. Progress is being watched very carefully so that production keeps pace with the growing need for these bricks. The creation of a new price structure is still engaging the attention of the National Coal Board and the Council are being kept informed of developments.

Plans have been approved for the erection of a new wet purification plant at the Dunfermline Corporation Gas Works at an estimated cost of £9,665.

Members of the Billericay Urban District Council visited Watson House on Jan. 5, and were taken round all the laboratories. Mr. G. C. Holliday welcomed the members and gave them a general outline of the work carried out at Watson House.

Campbeltown's Municipal Gas Loss, which was reported to be over 10 mill. cu.ft. last May, is diminishing and is now reported to be 12.81%. Bailie Campbell, Convener of the Gas Committee, told the Council at its last meeting that they had reason to believe that, at the end of the financial year the loss would be brought down to a level which they could accept.

The Directors of George Wilson Gas Meters, Ltd., entertained the staff and workpeople at Jarrow to a Christmas party. A similar party was held in 1947, but this was the first event following a complete year's working at Jarrow. The party was enjoyed by over 130 people. A member of the works staff expressed good wishes to the firm, to which Mr. W. D. Wilson responded.

Tunbridge Wells Gas Company has called all holders of its securities to a meeting at Gas Industry House, S.W.1, on Jan. 28, for the appointment of a stockholders' representative under the Gas Act. A resolution will be proposed for the appointment of Sir Harold Howitt, a partner in Messrs. Peat, Marwick, Mitchell & Co., and a member of the tribunal set up to assess compensation to be paid to colliery owners under the Coal Nationalization Act, to this position.

A Special British Pavilion will be included in the next International Fair of Ghent, to be held on Sept. 10-25. To save exhibitors the trouble of arranging for standfitting overseas, the rental includes the provision of a shell stand provided by the organizers of the British Pavilion. Application for space should be made to British Pavilion Ghent Fair, 395a, Edgware Road, London, W.2; Robertson Buckley & Co., Ltd., Bereys Buildings, George Street, Liverpool, 3; or to S. R. Tippett & Co., Ltd., Cannon Street House, Cannon Street, London, E.C.4.

George Orme & Co., Gas Meter Manufacturers, of Glasgow, are tenants of one of the ten new factories at Queenslie Estate, near Glasgow, handed over last week by Scottish Industrial Estates, Ltd., to its occupiers. The factory will offer opportunity for greatly expanded production when in full operation, and the intention is ultimately to rely on this unit for the Scottish distribution, leaving the Oldham plant to handle English business. The plant is an assembly unit, on modern straight flow lines and with modern facilities for staff. Work will begin on small high capacity units and on 80/100 cu.ft. high capacity types.

Moderate Improvement in the supply of round coal to gasworks in Scotland was manifested during the past month, but while the gap between deliveries and basic allocation was narrowed the shortfall was still considerable. Any trouble arising at the gas-works at the moment is due to unequal stock holdings. Aggregate reserves at the works are higher than they were a year ago, but wide variations occur in individual cases. A number of works took advantage of opportunities during the summer of accumulating as much as possible, and in some cases the equivalent of six weeks' supplies was laid down by the beginning of winter. Others anxious to obtain the particular grade of coal most suited to their plant, and for other reasons, did not take up all the tonnage offered by the marketing authorities, and as the availability of supplies deteriorated later, the leeway in stock programmes was not made up.

The First of three special meetings of the Headquarters members of the Women's Gas Council in preparation for the Spring Conference on Home and Citizenship, to be held at Harrogate from April 26-29, was held on Jan. 6 at Gas Industry House. The subject—the formation and running of discussion groups—was in the hands of Mr. G. P. Wright, District Organizer of the Workers' Educational Association, who contended that the educational, sociological, and psychological aspects of home life were as important as the more practical side. Miss H. Masters, of the Domestic Science Department, Battersea Polytechnic, said that any woman who took a real interest in running a home had her own opinions and ideas. A fundamental knowledge of cookery was of primary importance, and this was not simply the exchanging of recipes. The other two dates in this series of talks leading up to the Conference are Feb. 14, when Dr. Leslie Housden will speak on "The Child in the Home," and Mar. 16, when the subject will be "The Family in the Community," and the speaker Alderman A. T. Pike, O.B.E., J.P. Further particulars may be obtained from the Secretary, Women's Gas Council, 1, Grosvenor Place, S.W.1.

LONDON AND COUNTIES COKE SALES CIRCLE

INAUGURAL MEETING

THE inaugural meeting of the London and Counties Coke Sales Circle was held at Gas Industry House on Jan. 7. Mr. F. S. Evans (South Metropolitan Gas Company) presided over an attendance of 200, representing coke producers and distributors in exactly equal proportions.

The **Chairman** said the large number present had answered by their action the first question which they had to consider, namely, was there sufficient interest in coke matters to start a discussion group? Before the war there were two Coke Salesmen's Circles, one for producers and one for distributors. They met regularly and he believed they were very successful, but at the outbreak of hostilities their meetings were discontinued. In the ten years that had since elapsed there had been considerable progress in coke matters. Smoke abatement was coming to the forefront of the public mind following the Government's acceptance in principle of the Simon Report and the provision by the municipalities of smokeless fuel burning grates on many housing estates. There had indeed been a distinct advance in the design of those grates and in the collection of data on what constituted comfortable living conditions, not only at Abbots Langley.

Rising Coke Production

On the other hand, we were as a country producing more coke than had ever been produced before, and although they were experiencing no difficulty in disposing of that coke, due perhaps to restrictions and shortages of other solid fuels, the position might change more rapidly than many of them thought, and the London and Counties Coke Association, starting from its Technical Committee, felt that it was opportune, in spite of the imminence of the nationalization of the gas industry, to consider whether those discussion groups should be re-created, and that view, he believed, was endorsed by the Distributors' Branch. A small panel was set up, consisting of Mr. W. E. Daniel, Mr. Jack Charrington, Dr. F. J. Eaton, and himself, and they found that their ideas were almost identical, but they questioned whether they could really talk for the two sides. Therefore they asked the London Coke Contractors' Association and the London Coke Committee to nominate a small Steering Committee, consisting of six from the producers and six from the distributors, and it was their findings that were now to be discussed.

With the uncertainties of the future with regard to the gas industry, what they had in mind—certainly what Mr. W. K. Hutchison, the Chairman of the Technical Committee, had in mind—was that they should re-start as a band of enthusiasts on a flexible basis and let development take place in the light of circumstances as they arose. There were so many things they could not foresee; they could start, for example, under the ægis of the London and Counties Coke Association, and perhaps they could look to them for the small amount of finance that was required; at any rate they would try it; but in six months' time there might be no London and Counties Coke Association, and they might have to finance themselves. Under the new set-up one Circle might or might not be sufficient. They might desire a Circle for every Region, or even in every large town. They just could not at this stage foreshadow development. But even with all the uncertainties of the future he believed that only good could come out of discussing their problems frankly and exchanging their knowledge and their experience. He was sure there was very much that could be done by the establishment of a Coke Sales Circle.

Not a Moment too Soon

Mr. **John Charrington** (London Coke Contractors' Association) said he was delighted that the Coke Sales Circle movement was not only to be revived but that there was to be one Circle instead of two, and it was a particularly delightful gesture on the part of the London and Counties Coke Association that they should have asked a distributor to be President of the Circle. He thought the Circle was being revived at the right moment, not a moment too soon. They were facing a time when coke would need far more selling than in the past, and the more they could study the science and the best form of selling the better it would be for them individually, and for coke in general. As eager and enthusiastic coke salesmen they must report whether coke was under a handicap here or in danger there. Truthfulness and fearlessness never did anything or anyone any harm, and if they could provide information that would be helpful to those at the centre they would be helping forward that which they were all trying to do.

At the moment, in spite of what some official people thought, he rejoiced in the fact that there seemed to be plenty of coke about, and nothing would please him more than to see it freed from restrictions. Under present conditions coke was severely handicapped from the point of view of price and it would not be easy to develop coke sales while the price was out of step with the price of other fuels.

The greatest need for coke salesmanship at present was in the domestic market. The coal and coke merchanting firms, perhaps even more than the coke producers, needed the help of coke salesmen in developing an ever-increasing number of uses for coke, and in their specification of the use of coke in domestic boilers.

Looking to the future, he was not in the least damped by the fact that the gas industry was to be nationalized. After all that had been done over many past years by the London and Counties Coke Association it would seem strange not to be dealing with the Gas Light and Coke Company, the South Metropolitan, and all the other companies with which they had been familiar, but he was encouraged by the fact that the Gas Council and the Area Gas Boards had been so aptly appointed. Mr. A. E. Sylvester and Colonel H. C. Smith had been enthusiastic for this work in the past and he could not help thinking that they would wish to see that work continued in the future. He was glad that the Circle was being revived before nationalization actually took effect, because the nationalized gas industry when it came into being would find something all ready to hand for building up the future of coke.

Technical Sales Angle

Dr. **F. J. Eaton** (Gas Light and Coke Company), in proposing a vote of thanks to Mr. Charrington for his address, said he had given them a programme that would keep them occupied for many years. They all knew Mr. Charrington's enthusiasm for coke, and he had been particularly struck by a point he had made about coke salesmen telling the truth. They could not sell their product unless they did so, because sooner or later they were going to be found out. In the new Circle they were departing from the salesman's angle and going on to the technical sales angle which was so necessary and important in fuel technology to-day. The person who went to the consumer should go in a technical capacity for the purpose of telling him what was the best fuel to use, and the best way to use it, whether it be coke, or oil, or whatever other fuel they were handling.

Developments in fuel technology in the last few years had been very wide indeed, particularly in the coke field, and through the medium of the Circle much information could be made readily available, and that was perhaps the greatest function the Circle could perform.

The **Chairman** announced that some letters—from absentees expressing their apologies, and from well wishers—had been received. One was from Mr. W. L. Boon, who was active in the previous Circle and who wished them very well in the setting up of the new Circle. There were just 200 present at the meeting, exactly half of whom were producers, and half were distributors, and already they had a prospective membership of over 300. They had received an application from Sheffield, which certainly never was in the London area. And they had had one objection. The objection was from an Area Gas Board Chairman-designate who thought they were a little too precipitate, and that they should wait until nationalization was in fact accomplished before forming the Circle.

Title and Rules

The meeting unanimously agreed, without formal resolution, that a Coke Salesmen's Circle was needed, and that it should be a joint organization of producers and distributors. It then proceeded to discuss the rules and constitution.

The **Chairman,** on the question of title, pointed out that the new proposal was to call the Circle the "London and Counties Coke Sales Circle." Originally the word "Salesmen's" was used. Dr. Eaton had made the point that they were becoming a little more technical, and to broaden the net they proposed to substitute the word "Sales." They might well have producing engineers and technicians of the highest order among their members.

The object of the Circle was agreed to be "to promote the exchange of information on all matters concerning the sale and utilization of coke; in particular to discuss papers submitted by members or others and to visit works of producers, appliance manufacturers, and modern coke installations." The Circle will consist of Ordinary Members, who "shall be principals or shall hold positions on the technical, administrative, or coke sales staffs of coke producers and distributors who are members of the London and Counties Coke Association or of the Coke Distributors' Branch."

The Annual General Meeting will be held each year in May. Officers will consist of a President, Chairman, Vice-Chairman, Secretary, and a Management Committee of 12 members (six producers and six distributors). Ordinary meetings will be held four or five times a year and extraordinary general meetings may be held from time to time either as decided by the Management Com-

mittee, or on the written application of not less than ten members.

The rules were discussed with great attention to detail, particularly in regard to the principle of ensuring that a proportion of the members of the Committee should retire from time to time to ensure a steady flow of new blood into the administration.

Election of Officers

On the proposition of the Chairman, seconded by Mr. F. J. Laws (Tottenham and District Gas Company), Mr. John Charrington was unanimously elected President, and on Mr. Charrington's proposition Mr. F. S. Evans was elected Chairman. Mr. W. E. Daniel (Ashby & Co.) was elected as Vice-Chairman, and Mr. F. S. Haddock, who was Secretary of the pre-war Coke Salesmen's Circle and had been Acting Secretary for the new Circle, was elected Secretary.

Mr. **R. Summerson** (Luton) proposed the election of those members of the Steering Committee not already appointed to other offices as members of the Management Committee, to serve until the Annual General Meeting in May, 1950. The names were: Gas Undertakings: D. G. Rose (Gas Light and Coke Company and London Coke Committee), Dr. F. J. Eaton (Gas Light and Coke Company), G. H. Fuidge (South Metropolitan Gas Company, W. Johnson (Wandsworth and District Gas Company), and F. J. Laws (Tottenham and District Gas Company). *Coke Distributors:* M. E. Allan (Adler & Allan), J. Charrington, Junr. (Charrington, Gardner, Locket & Co., Ltd.), E. C. Mills (Rickett, Cockerell & Co., Ltd.), and C. P. Robinson (Webb Bros.). It was left to the Committee to co-opt three other members to bring the total up to twelve.

The **Chairman** said it was proposed to hold a meeting some time in March at which a paper on "Complaints" would be presented by Mr. G. H. Fuidge (South Metropolitan Gas Company), to be followed by discussion. In May there would be the Annual General Meeting, and in June it was hoped to take the members to visit some works, probably at Kensal Green or at Ponders End. In October they hoped to have another paper, probably from Dr. Eaton, with reference to some of the work which he was doing.

Following an informal discussion the members voted in favour of meeting at 2.30 p.m., preferably on Wednesdays, though it was generally agreed that by way of experiment one or more meetings might be held on a Friday. The Chairman said that practically 100% of those present had signified their intention of becoming members of the Circle. Asked whether there would be any facilities for electing Honorary Members from among the appliance manufacturers, the Chairman said the Management Committee would consider the matter and report back. Mr. Laws pointed out that in the old days they occasionally had papers from people on the appliance side and he suggested that it would be advantageous to invite their co-operation as far as possible.

The **Chairman** said that as persons interested in the utilization of coke the appliance manufacturers would be very desirable members of the Circle, but the meeting had agreed to a constitution which limited membership to those who were members of the London and Counties Coke Association; this need not, however, preclude them from inviting them to their meetings.

Mr. **B. H. Almond** (Watford and St. Albans Gas Company) expressed thanks to Mr. Evans for presiding. Mr. **Freeth** (Southampton said an expression of thanks was also due to Mr. Haddock for all that he had done as Acting Secretary in arranging a meeting which had been so well attended.

SOME HOLMES CONTRACTS IN 1948

CONTRACTS completed during last year, representing a very substantial increase in sales, and those at present in progress, indicate the wide range of activity in the gas industry that is within the scope of W. C. Holmes & Co., Ltd.

Installations completed in the last twelve months include extensions of considerable importance, and among these are complete cooling and wet purification plants at Oldham, dealing with 4½ mill. cu.ft. of gas per day, and at the new Ponders End Works of the Tottenham & District Gas Company, where ancillaries in the form of benzole, dri-gas and ammonia washing plant, together with two Holmes-Connersville exhausters, each of 9 mill. capacity and four Holmes-Connersville meters each of 2½ mill. capacity, with remote indication of registration and rate of flow, have been installed. Another important installation, that at the new works at Pontypool, included among other Holmes products two 5 mill. cu.ft. exhausters and one 6 mill. cu.ft. meter. A similar contract has been completed at Stoke-on-Trent, and another is in course of erection at Torquay. Many Holmes-Connersville installations have been carried out during the past year among which were meters at Darlington and South Metropolitan, and exhausters at Salford and Southampton (two machines of 8 mill. and 6 mill. cu.ft. respectively).

From a statistical view-point, it is interesting to record that in 1948 Holmes-Connersville meters were installed for a total capacity of nearly 200 mill. cu.ft. of gas per day and for the B.M. Industrial Meter 35 mill. cu.ft. per day. Holmes-Connersville blowers have also been supplied in large numbers for oxide revivification, and inert gas generators have been supplied for bringing holders and other plant safely into or out of commission.

In the field of electrical precipitation, about 240 plants have now been put to work, and a number of the last year's output of 40 detarrers were exported to Canada, South America and other countries. Recent developments include two-stage detarring on bituminous coal-fired producers, precipitators for cleaning the fly-ash from boiler plants, and for hot gases and mist precipitation in two stages for contact plant in the manufacture of sulphuric acid.

A modern method of purification of gas by ferric oxide on a large scale is applied in the development of "tower" purifiers, and units at present in process of erection by Holmes include the first half of a 24 mill. cu.ft. installation at the Nechells Works of the Birmingham Gas Department, and extensions to the existing plant at Wandsworth to increase capacity by a further 10 mill. cu.ft. Further installations are in hand for Smethwick, Swan Village (Birmingham), and for the United Kingdom Gas Corporation's new works at Tingley. The application of the "Manchester" liquid process for removal of H_2S (held under joint licence from the Manchester Gas Department) is regarded as being of great importance.

Although research into the many attendant problems and the development of plants to assure the reliability demanded by the British gas industry is by no means accepted as complete, a limited number of plants of an experimental nature are under construction. Foremost among these is a plant for a 5 mill. cu.ft. stream at the Linacre Works of the Liverpool Gas Company, due for completion in April next. Other plants in the process of manufacture are to the orders of the Newcastle-on-Tyne & Gateshead Gas Company, the Radcliffe, Farnworth & District Gas Company, and the Ossett Gas Department.

Since further progress was somewhat restricted by the recent war, the supply of catalytic sulphur removal plants manufactured under licences from the Gas Light and Coke Company, and Dr. Maxted, Professor of Chemistry at Bristol University, have been confined to consumers in certain industries. Noteworthy among these is the glass industry, where it is interesting to note that apart from effecting economies in the utilization of gas and, indirectly, on processes subsequent to heat treatment, the supply of sulphur-free gas has opened up new avenues to the artists engaged on the design of ornamental and table glassware. Over the past seven years, 14 of these plants have been installed. In the heat treatment of non-ferrous metal, and in providing sulphur-free furnace atmospheres, the plants are invaluable. One plant handling 15,000 cu.ft. of gas per hour has been employed continuously for the past five years in connexion with the heat treatment of metal of the highest quality for turbine blades of jet engines, and an extension is now being put in hand.

Increased attention is being given by the gas industry to the problem of effluent from gas-works. Phenols were found to be the most objectionable constituents of such effluent, and schemes were developed by Messrs. Holmes, not only to remove but to recover the phenol. The successful dephenolation of gas liquors was demonstrated on two plants, in Manchester and Glasgow, before the war. This process, which is likely to assume considerable importance, has been further developed since the war. Two plants for the treatment of low temperature carbonization liquor are approaching completion, and these use solvents with more favourable characteristics than benzole, resulting in considerable economy in the recovery process.

The disposal of effluent from new gas-works, particularly those sited where ready means of disposal are not available, is a special problem. Messrs. Holmes have recently procured orders for the construction of two plants under these circumstances for the United Kingdom Gas Corporation. The object is to eliminate all effluent, and to recover for sale the phenols, concentrated ammonia liquor, and ammonium chloride.

In order to increase manufacturing capacity, works extensions were carried out during 1948, and further improvements, such as semi-mechanization of the foundry, are scheduled, with the object of stepping up production to meet the increasing needs of the gas industry. To provide for future expansion, an additional four acres of land has been acquired at Turnbridge.

Since 1936 the Incorporated Sales Managers' Association has conducted an Examination in Salesmanship, and the last examination under the existing syllabus will be held on May 28. Entry forms may be obtained from the Secretary, I.S.M.A., 23, Bedford Square, London, W.C.1. As from 1950, the Examination in Salesmanship, suitably revised, will become the responsibility of the United Kingdom Commercial Travellers' Association, 180, Tottenham Court Road, London, W.C.1.

HEAT AND POWER CONFERENCES

Members of the Institution of Gas Engineers and the Gas Research Board are invited to attend two full-day conferences arranged by the Institute of Fuel "to stimulate interest in the subject of interlinking of plant for the generation and utilization of steam and power" to be held at the Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, on Jan. 25 and April 27, the sessions commencing at 10 a.m. and 2 p.m. each day.

The three papers to be presented at the first conference have been printed in the December issue of the *Journal of the Institute of Fuel*. A limited supply of reprints of these papers will be available for intending participants in the discussion, to whom copies will be sent on application to the Institute of Fuel, 18, Devonshire Street, London, W.1.

BIRMINGHAM GAS PRICE TO RISE

Councillor Seymour J. Brown, Chairman of Birmingham Gas Committee, told the City Council meeting on Jan. 4 that a further increase in the price of gas would be necessary from the beginning of the next financial year. Output, he said, was about 10% greater than in the previous year, but the upward trend of prices had not been halted.

Coal was costing an average of 58s. 6d. per ton delivered compared with 24s. 3d. per ton in the year ended March, 1939. The price of gas oil had advanced in the same period from 4¼d. to 10d. per gal. delivered. Other materials and wages had also substantially increased and it was obvious, Councillor Brown argued, that these rising costs must be eventually reflected in the price of gas. It was only by the most skilful management of the undertaking that it had been possible to continue to supply gas at the comparatively cheap price operating.

He pointed out to the Council in July that the increase of 1d. per therm, which came into operation in March, did not fully balance the increased costs, to meet which would have entailed a cost of 1½d. per therm. Since then, prices had continued to rise. The last increase in the price of coal—in July, of 2s. 6d. a ton—represented a further cost to the Department of £130,000 a year. The Committee was more concerned at the rising capital charges which were being entailed in the provision of large extensions to gas manufacturing plant to meet the ever growing demand, particularly as such capital charges were now two or three times greater per therm than in 1938.

Answering Alderman Byng Kenrick, Councillor Brown said that there was very little difference in the pressure of gas now, compared with before the war. In some localities there might be some difficulties but if they were reported they received immediate attention.

SHORT-WEIGHT COAL

Copies of a National Coal Board memorandum setting out a code of practice for dealing with complaints of short-weight coal have been circulated by the British Gas Council to member gas undertakings. The code covers two main fields: (1) the method by which a consumer and/or distributor should make his complaint; and (2) the steps to be taken by the Board on receipt of a complaint.

Complaint should in the first place be lodged by the buyer with the concern which executed the order, *i.e.*, with the distributor or, where there has been a direct sale by the Board, with the appropriate Area Marketing Manager. Where a distributor is employed he will take up the complaint with the appropriate Area Marketing Manager. If the complainant is dissatisfied with the reply, then the distributor or the direct buyer (as the case may be) should refer the matter to the Divisional Marketing Director. The buyer who still feels aggrieved after reference to the Divisional Marketing Director should arrange with his trade organization for the full details of the case to be forwarded to headquarters of the National Coal Board.

Criticism can be allayed by carrying out good weighing and shipment practice at all stages and by dealing with any complaints in such a way as to convince the buyer that his complaint has been judged on its merits and that any payment or refusal of compensation is a correct reflection of the ascertainable facts of the case. If this confidence is achieved a long step will have been taken to improve the Board's relations with their buyers. At all levels the Board's servants must treat buyers' complaints fairly on their merits.

The code sets out in detail the procedure to be followed in investigating complaints, and concludes: "Every Divisional Marketing Director should ensure that procedure in his division exists which will guarantee that all complaints are dealt with on this basis, and that so far as possible each area deals with complaints in the same sort of manner on their merits."

STOCKPORT PROJECT OPPOSED

The fears of residents that Poynton will lose its identity as a parish and disappear into the growing "greater Stockport" have been raised again with the plans by the Stockport Corporation to build a gas-works on a plot of land adjacent to the railway station at Poynton. The works are designed to cover 82 acres of pasture and arable land. Because the area around the Stockport Gas-Works at Portwood was completely built up, a report was submitted to the Stockport Council in December, 1946, pointing out that a site was required for a new gas-works, and exhaustive visits were made to available sites in the gas area. It was decided that the site at Poynton was the most suitable. Application was made to the Ministry of Fuel and Power and, in view of the impending nationalization, the matter was left in abeyance for the time being, but the Ministry requested the officials to notify the Ministry of Town and Country Planning that a site would be required. The Town Clerk, Mr. J. H. W. Glen, submitted an application for a site to be reserved under the Town and Country Planning Act for a gas-works site.

Macclesfield Rural District Council, asked to approve the proposal to reserve the land for the plant, passed on the plan to Poynton Parish Council for their observation. There, the plan has met its first main obstacle. The Council, at its monthly meeting, opposed the plan. Members realized that one of the causes of the scheme was their recommendation to the Macclesfield R.D.C., that the plot of land in question should be zoned for industrial purposes, but they felt that a gas-works would be injurious to the district.

At a special meeting to consider the project it was stated that people come out of the towns to live in the Poynton for fresh country air, and that it was a dormitory for Manchester. The land covered by the plan is owned by several Poynton residents and covers several farms. It is at present in use for arable or pasture purposes. On land nearby there used to be a small gas-works which many years ago supplied Poynton with gas.

Mr. T. Reynolds, Engineer and Manager, states that a modern gas-works is by no means an eyesore, and it is not necessary to have gasholders on the site. Any new gas-works would be entirely screened by doubled rows of trees, and need not be visible. It is a question of no gas—or a works which would appreciate the rateable value of the area. There would be no pollution or fouling of the country air.

ALUMINIUM AND ITS ALLOYS

The British Standards Institution has recently published a new British Standard for Wrought Aluminium and Aluminium Alloys, Sheet and Strip (B.S. 1470:1948) which is the first of a comprehensive series of British Standards for aluminium and aluminium alloys for general engineering purposes. Certain of these materials are already covered by British Standards, but work has been in progress for a considerable time on schedules which would incorporate a comprehensive range of materials in various forms, adequate for the large majority of general engineering applications. The selection of grades of aluminium and the alloys to be included in the schedule has been the result of close collaboration between manufacturers, users, scientific organizations and others interested in the manufacture and utilization of light alloys, through the established machinery of the B.S.I.

Work is well advanced on similar schedules for aluminium and aluminium alloys in the following wrought forms, and for aluminium and aluminium ingots and castings: Tubes, forgings, wire for rivets, welding wire, and wire for general purposes. A draft British Standard for aluminium and aluminium alloy bars, rods, and sections has been circulated, and this will form the basis of a further British Standard in the series. Works is also in hand on a British Standard for aluminium and aluminium alloy plates.

A feature of the new standard is the system of nomenclature. The Institution has adopted a system of letters and numbers denoting material, form of product, heat treatment and condition; this system will be used throughout the series. Care has been exercised in the choice of the symbols to avoid ambiguity and confusion with other systems of identification. It is hoped that the system will be adopted throughout industry, and that care will be taken to ensure that the correct symbols are employed to avoid unnecessary delay and misunderstanding, especially at first when the system is unfamiliar.

The standard is arranged in two parts. The first contains the clauses relating to chemical composition, conditions in which the material is available, and mechanical properties, for the three grades of aluminium and the eight alloys which have been standardized. The second part contains the general clauses applicable to all the materials. Tolerances are given in the form of six tables. Recommended sizes of aluminium and aluminium alloy sheet and strip are included as an appendix, and although these do not form a mandatory part of the British Standard, they should be of considerable use in practice. Copies of this British Standard can be obtained from the British Standards Institution, Sales Department, 24, Victoria Street, S.W.1, price 3s. 6d., post free.

COMMERCIAL AND INDUSTRIAL UTILIZATION OF GAS: NO. 3

By F. DICKINSON, M.Inst.F.,

Industrial Gas Engineer, Newcastle and Gateshead Gas Company

(*Continued from p. 100*)

HEAT TRANSFER, LOSSES AND RECOVERY

THE first law of heat transfer is that heat always travels from a high temperature source to a low temperature receiver. This does not mean that the lower temperature body does not radiate heat as well as the higher temperature body, but that on balance the final effect is that the heat flows from the higher to the lower temperature body. The motive force that causes heat to flow is a difference in temperature, and it travels by one or more of three different ways —*i.e.*, by conduction, convection, and radiation.

Conduction occurs within a body in the direction from the warmer to the cooler region by communication of the molecules of the substance.

Convection is the means by which heat is conveyed from one place to another by the circulation of a gas or liquid. This can be by natural convection due to differences in the density of a fluid accompanying differences in temperature, or by forced convection produced by mechanical means such as by a fan or pump. Evaporation and condensation, involving latent heat and possibly the flow of liquids, are classed as forms of convection, although they are usually treated as separate additional forms of heat transfer.

Radiation is transmitted through space from a higher temperature body to a lower temperature body at a distance without warming the medium within the intervening space.

The principles of heat transfer are applied in most branches of engineering, such as in the design of evaporators, stills, condensers, driers, boilers, heating and cooling systems, compressors and engine cylinders, the lubrication of bearings, heat exchangers, and furnaces. In the main we shall be dealing with the last item.

Some definitions are necessary, as follows:

Heat Flow. This is the heat which is conducted through a material and lost on the cooler side by the combined effects of radiation and convection.

Unsteady State. This is the condition when the flow of heat into the hot face is greater or less than that flowing from the cool face, causing the temperature gradient within a substance to be constantly changing with time.

Steady State. This is the condition when the flow of heat into the hot face of a wall is the same as that flowing from the cool face. The temperature will be different at different points within a substance, but for any given point the temperature will remain constant. It is frequently referred to as thermal equilibrium.

Heat Storage. The amount of heat stored in a body such as a furnace lining. In effect, the total heat lost when a hot furnace is completely cooled to room temperature, or, conversely, the amount of heat which must be put into the lining when a furnace is heated.

Resistances. These are the three resistances encountered when heat is transferred from one face of a body to the other—*i.e.*, through the two surfaces by radiation and convection, and through the solid barrier by conduction. At the surfaces the resistances depend upon the radiation or absorption value of the surfaces and the mass velocity and molecular weight of the film or films of gas adjacent to the surfaces. This can be seen in the case of transferring heat from hot flue gases to cold air through the walls of a recuperator tube, where the considerable temperature difference between the hot flue gases and the cool air is due to the insulating effect of the quiescent film of gas on the one side, and air on the other side, of the solid barrier, and the temperature difference through the latter is out of all proportion to that of the former. To overcome these films it is necessary forcibly to tear them away from the surfaces of the solid barrier by arranging for smaller streams of higher velocity turbulent gas flow. The solid barrier offers a resistance proportional to its thickness and inversely proportional to the thermal conductivity of the material of which it is composed. For any given thickness, the best insulating material, silica aerogel, offers some 16,000 times the resistance of the poorest insulators (or best conductors), such as silver or copper. The possible variations in the heat transfer at surfaces is tremendous, particularly by convection, where the highest rate yet obtained for condensing vapours is of the order of 16,000 times that of natural convection of air. The difference in the radiation values of various surfaces is not so great as that in convection and conduction, although the surfaces of many materials such as brick, asbestos board, and painted surfaces radiate nearly 50 times as much heat as is radiated from a polished copper surface at the same temperature. A 2 in. thick copper plate has about the same insulating value as a copper sheet 0.002 in. thick, for the resistance of the copper itself to the conduction of heat is insignificant compared with the surface resistance to transfer by radiation and convection. In contrast, for a good insulator with surfaces exposed to air flow the surface resistances are small compared with the resistance to conduction of the body of the insulator.

Definition of Terms. The ability of any substance to conduct heat is expressed by its thermal conductivity, which is stated in terms of the B.Th.U. conducted per hour through one square foot of the material of unit thickness per degree Fahrenheit difference in temperature of the two surfaces. The unit of thickness is usually either one inch or one foot. The thermal conductivity is denoted by the small letter " k," and for any thickness by "x," the resistance to conduction is therefore $\frac{\text{"x"}}{k}$.

The resistance due to radiation and convection at the surface of any solid barrier is usually expressed as $\frac{\text{"1"}}{h}$ or $\frac{\text{"1"}}{f}$, where " h " or " f " is the surface or film conductance in B.Th.U. per hour per square foot of surface per degree Fahrenheit difference in temperature across the film.

If the temperatures are measured in the gas or liquid at some distance from the surfaces of a solid barrier the over-all transfer of heat may be denoted by the over-all coefficient " U," which is expressed in B.Th.U. per hour per square foot of surface per degree difference in temperature t1—t4. Since the same amount of heat travels successfully through one surface film from t1 to t2, then through the solid barrier from t2 to t3, and then through the second surface resistance from t3 to t4, it is possible by equating the three expressions for heat travel to express the amount of heat by U(t1—t4). " U " is expressed then as

$$\frac{1}{\frac{1}{h_1}+\frac{x}{k}+\frac{1}{h_2}}$$

or, if the three resistances $\frac{1}{h_1}$, $\frac{x}{k}$, and $\frac{1}{h_2}$ are called R_1, R_2, and R_3, then the overall resistance

$$\frac{1}{U} = R_1 + R_2 + R_3$$

The above outline covers the fundamental principles of heat transfer and some of the terms commonly used in calculations for the design of heat exchangers and furnaces.

Heat Losses from Furnace Walls

There are tables available showing the heat losses for furnace walls of various thicknesses and material at various internal temperatures, but occasions can arise where these do not cover specific requirements, and it is useful to be able to evaluate from basic principles the heat losses from appropriate wall structures, and the junction temperatures between the different materials. The formula generally used for calculating the heat loss through materials is:

$$Q = \frac{t_1 - t_2}{\frac{x}{k} + \frac{1}{a}} \times A$$

Where Q = heat loss in B.Th.U. per hour.
t_1 = temperature of hot side of wall in °F.
t_2 = temperature of cool side of wall in °F.
x = thickness of wall in inches.
k = conductivity constant in B.Th.U./sq.ft./in. thickness per °F. per hr.
$\frac{1}{a}$ = surface resistance (R) usually expressed as 0.5.
a = surface heat transmission factor.
A = area of internal (hot surface) in square feet.

As an example, assume a furnace having internal dimensions of 4 ft. wide by 6 ft. long by 2 ft. high to rise of arch with varying wall structures, required to operate at 850° C. (1,560° F.) with a shop temperature of 60° F. Three major calculations are required in order to assess the gas consumptions and the burner equipment, as follows:

(*a*) Maintaining rate—*i.e.*, the gas required to maintain the furnace at 850° C. with door closed, and no throughput.
(*b*) Gas required to bring the furnace up from cold to temperature. For daily operation this is more on a Monday than on the following days.
(*c*) Gas required for defined throughput of heated articles per unit time—usually per hour.
(*d*) When designing the wall structure a further calculation is necessary to ensure that junction temperatures are below the maximum temperatures allowable for the materials employed.

Heat Losses from Varying Wall Structures

(*a*) 4½ in. firebrick:

$$\text{Heat losses per hour} = \frac{1{,}560 - 60}{\frac{4.5}{10.5} + \frac{88}{0.5}} \times \frac{88}{1} \text{ sq. ft.}$$

$$= \frac{142{,}000 \text{ B.Th.U.}}{\text{Rate of heat flow} = 1{,}614 \text{ B.Th.U./sq.ft./hr.}}$$

(*b*) 4½ in. firebrick and 3 in. insulation:

$$\text{Heat losses per hour} = \frac{1{,}560 - 60}{\frac{4.5}{10.5} + \frac{3.0}{0.75} + 0.5} \times \frac{1}{1} \text{ sq. ft.}$$

$$= \frac{26{,}280 \text{ B.Th.U.}}{\text{Rate of heat flow} = 303 \text{ B.Th.U./sq.ft./hr.}}$$

(*c*) 4½ in. firebrick, 3 in. insulation, and 4½ in. redbrick:

$$\text{Heat losses per hour} = \frac{1{,}560 - 60}{\frac{4.5}{10.5} + \frac{3.0}{0.75} + \frac{4.5}{8.0} + 0.5} \times \frac{88}{1}$$

$$= \frac{24{,}280 \text{ B.Th.U.}}{\text{Rate of heat flow} = 273 \text{ B.Th.U./sq.ft./hr.}}$$

(*d*) Reduction in heat losses:

As the addition of a 3 in. course of diatomaceous insulation gives a reduction of 81% in heat losses, and the further addition of 4½ in. of redbrick only modifies this to 83% reduction, there is little benefit by so doing, since the 2% difference can hardly be justified by the fuel saving on an intermittently operated furnace when offset against the total extra cost of capital installation involved. The redbrick wall was included to illustrate the method of calculation. The best practical structure is Item (*b*), but even here a factor has to be used to balance the heat required for maintaining an intermittently operated furnace as against a continuously operated furnace with the wall structure saturated at the defined internal temperature forming the basis of the above calculations. An appropriate constant would appear to be 0.25 bringing the heat loss figure for fuel computation to 105,120 B.Th.U./hr.

Wall Junction Temperatures

When deciding the thicknesses of firebrick walls, insulation backing, and redbrick outer walls (where used), it is necessary to be able to ascertain the effect of the addition of these exterior walls. As there is a fairly rapid flow of heat from the hot face of the firebrick to the cool face when the latter is exposed to shop temperature it is obvious that if a thickness of insulation is placed against the cool face it will check the flow of heat through the firebrick. In the above example the heat flow was reduced from 1,614 to 303 B.Th.U./sq.ft./hour, and the redbrick thickness reduced it to 273 B.Th.U./sq.ft./hour. It is thus inevitable that there should be a rise in temperature at the junction of the cool face of the firebrick and the hot face of the insulation, and again at the cool face of the insulation and the relatively hot face of the redbrick. As most commercial insulating bricks have a limiting higher temperature of about 1,600° F. (870° C.), above which there may be failure due to fusing, granulation, or spalling, due care has to be exercised in the selection of such compound structures for high temperature conditions. To ascertain these junction temperatures in the above examples we must transpose the formula, which will now read (omitting $\frac{1}{a}$) as follows:

With wall structure consisting of 4½ in. firebrick, 3 in. insulation, and 4½ in. redbrick:

$$t_2 = t - q\left(\frac{x}{k}\right)$$

(*a*) $t_2 = 1{,}560 - 1{,}614\ \frac{4.5}{(10.5)} = 1{,}560 - 692 = 868°$ F.

(*b*) Firebrick $t_2 = 1{,}560 - 303\ \frac{4.5}{(10.5)} = 1{,}560 - 130 = 1{,}430°$ F.

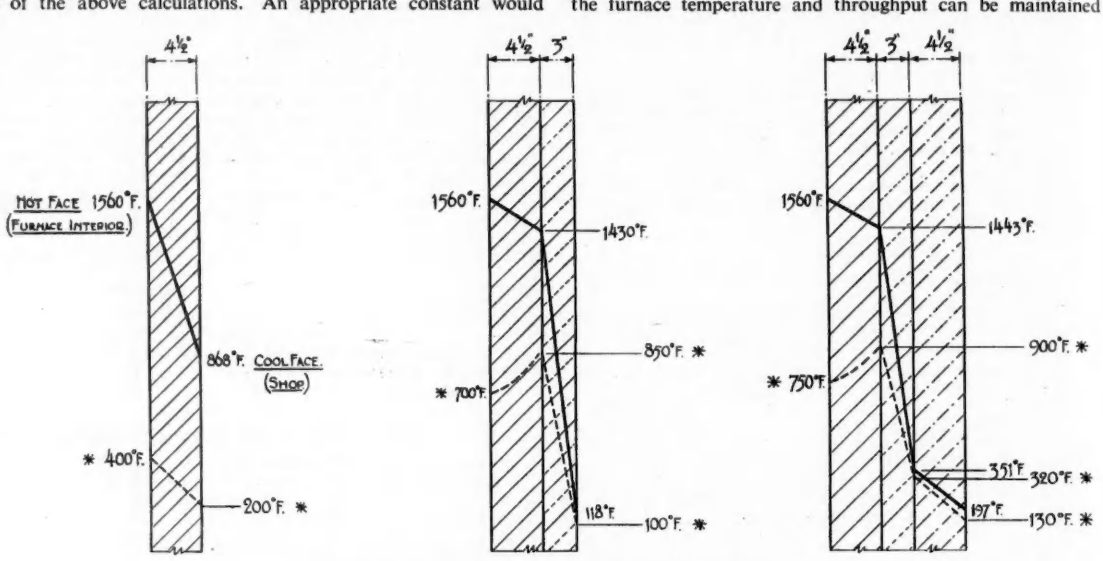
Insulation $t_2 = 1{,}430 - 30\frac{3}{(0.75)}\ \frac{3.0}{} = 430 - 1{,}212 = 118°$ F.

(*c*) Firebrick $t_2 = 1{,}560 - 273\ \frac{4.5}{(10.5)} = 1{,}560 - 117 = 1{,}443°$ F.

Insulation $t_2 = 1{,}443 - 273\ \frac{3.0}{(0.75)} = 1{,}443 - 1{,}092 = 351°$ F.

Redbrick $t_2 = 351 - 273\ \frac{4.5}{(8.0)} = 351 - 154 = 197°$ F.

The temperature of the outer wall face has thus been reduced from 868° F. to 118° F. by the use of insulation, and lifted to 197° F. by the addition of redbrick. It is interesting to note the tremendous drop in temperature across the insulation from 1,430° F. to 118° F. in the selected structure (item (*b*)). Obviously, the insulation will assist in retaining heat in the firebrick during the overnight periods so that less heat is necessary to bring the furnace back to the required temperature in the mornings. Another pertinent point is that, due to the rapid circulation of hot gases during the heating-up period, the inner face of the furnace is at temperature before the firebrick thickness is all re-heated, so that work can be commenced within about an hour of lighting-up. As the walls become saturated less heat is absorbed and more fuel is available for heating the stock. This is confirmed in practice by the fact that as the day progresses the furnace temperature and throughput can be maintained on a decreasing gas consumption. To assist in visualizing the above wall structures the data produced under (*a*), (*b*), and (*c*) are delineated in the accompanying diagrammatic sketch.



* ESTIMATED FURNACE TEMPERATURES AFTER OVERNIGHT SHUT-DOWN.

DIAGRAMMATIC SKETCH SHOWING EFFECT OF DIFFERING WALL STRUCTURES.

Initial Heating of Furnace

This consists of heating the furnace structure until the interior temperature of 1,560° F. is achieved. The component portions rise to proportionate temperatures, and in the following calculation it will be observed that the average temperature of each component is employed.

Heat content — Volume × Density × Mean sp. heat × temperature rise.

(*a*) Firebrick:

$$30 \text{ cu.ft.} \times 130 \text{ lb.} \times 0.25 \left\{\frac{1{,}560 + 1{,}430 - 60}{2}\right\} = 1{,}399{,}125 \text{ B.Th.U.}$$

(*b*) Insulation:

$$20 \text{ cu.ft.} \times 30 \text{ lb.} \times 0.20 \left\{\frac{1{,}430 + 118 - 60}{2}\right\} = 85{,}680 \text{ B.Th.U.}$$

(*c*) Cast iron casing:

$$1{,}000 \text{ lb.} \times 0.118 \times (118 - 60) = 6{,}844 \text{ B.Th.U.}$$

Total = 1,491,649 B.Th.U.

(*d*) Assuming two hours to bring the furnace up from cold to reasonable saturation, the gas rate per hour would be:

$$\frac{1,491,649}{2 \times 0.7 \times 500} = 2,131 \text{ cu.ft./500 C.V. gas/hour.}$$

Heating of Steel Production Articles

With a hearth area of 24 sq. ft. and a maximum loading of 60 lb./sq. ft. this represents 1,440 lb. of steel to be heated per hour, and the estimated gas consumption for this alone would be:

$$\frac{\text{1,440 lb.} \times \text{0.2 Sp.Ht.} \times (1,560 - 60) \text{ rise in temperature}}{\text{Available heat in gas at 1,560° F.} = \text{350 B.Th.U./cu.ft.}} = 1,232 \text{ cu.ft./hr.}$$

Summary

(*a*) Initial heating in 2 hours = 2,130 cu.ft./hr.
(*b*) Maintaining = 300 cu.ft./hr.
(*c*) Full operation at 1,232 + 300 = 1,532 cu.ft./hr.

Burner equipment to meet the above range of operating conditions could be arranged for a maximum gas rate of 1,800 cu.ft./hour.

The above method of calculation is basically correct, but would take far too long to evaluate for most commercial propositions. As in most branches of engineering, it has been found possible to save considerable time by the use of graphs, &c., developed from practical operating experience, but it is essential to establish the correct background and fundamentals as set out in the above example.

Calculations for Two Average Furnace Applications

In most instances it is necessary to ascertain the above gas consumptions for the assessment of both burner equipment and working costs. Two such cases are given below, one a low temperature and the other a high temperature process.

Example No. 1

A tank 7 ft. long by 2 ft. wide by 3 ft. high contains liquid equivalent to water for a depth of 2 ft. 6 in., which has to be heated to and maintained at 160° F. from 60° F. room temperature, and to heat 800 lb. of work per hour. Give relative gas consumptions.

It is obvious that there will be heat lost both from the surface of the liquid by evaporation and radiation, and from the tank walls by radiation. The latter can be minimized by the use of insulation. In this case the heat loss per square foot of bare tank wall at 160° F. would be 210 B.Th.U., with 1 in. insulation this would be reduced to 38 B.Th.U., 2 in. to 21 B.Th.U., and 3 in. to 15 B.Th.U. We will assume 2 in. of insulation, as the cost of the extra 1 in. hardly appears to be justified. (See Appendix for heat losses from tanks),

Data

Volume of water = 35 cu.ft. ∴ weight = 35 × 62.32 = 2,181.2 lb.
Area of exposed tank walls = (7 × 2.5 × 2) + (2 × 2.5 × 2) = 45 sq. ft.
Heat is applied to the base so no heat losses there.

(*a*) To heat from 60°-160° F.:

Liquid heating = lb. × Sp.Ht. × rise in temperature
= 2,181.2 × 1.0 × (160 − 60) = 218,120 B.Th.U.

Heat losses from surface and walls at mean temperature of 110° F.:
= Losses from surface + losses from walls
= (330 × 14) + (10 × 45) = 5,070 B.Th.U.

Total heat required = 223,190 B.Th.U.

At 60% efficiency, and with 500 C.V. gas = 744 cu.ft. gas.

(*b*) To maintain at 160° F.:

Heat losses from surface = (1,100 + 210) × 14 = 18,340 B.Th.U.
Heat losses from walls = 21 × 45 = 945 B.Th.U.

Total heat required = 19,285 B.Th.U.

At 60% efficiency = 64 cu.ft./hr.

(*c*) To heat 800 lb. steel per hour to 160° F.:

Heat required = lb. × Sp.Ht. × (160 − 60)
= 800 × 0.13 × 100 = 9,600 B.Th.U.
At 60% efficiency = 32 cu.ft./hr.

(*d*) It will thus be seen that while 744 cu.ft. gas is required to bring the bulk of liquid to temperature we can maintain this on 64 cu.ft./hr., and obtain full production on 64 + 32 = 96 cu.ft./hr. This disparity of consumption rates is by no means uncommon for such tanks, and can be met by using three bar rails each rated at 125 cu.ft./hr., taking two hours for initial heating, with automatic high-low flame control during operational hours.

Example No. 2

A normal type of refractory-line furnace 3 ft. 6 in. wide by 3 ft. 6 in. long by 1 ft. 3 in. high to rise of arch (internal dimensions), required to heat about 8 cwt. of steel per hour to 1,000° C., with 13½ in. firebrick walls, 9 in. firebrick, and 3 in. insulation arch, 9 in. firebrick hearth, and 4½ in. insulation at door. (See appendix for data on general principles of design.)

Additional Data

Flue gas analysis: $CO_2 = 10.5\%$, $O_2 = 0.5\%$, CO = Nil.
Effective value of 500 C.V. gas with above furnace temperature and analysis (Graph F), 220 B.Th.U./cu.ft.
Actual calculated heat losses and brick face temperatures from "The Efficient Use of Fuel," p. 397 (H.M. Stationery Office, 12s. 6d.).

Graphs

A.—Specific heat of refractories.
B.—Thermal capacity of refractories.
C.—Thickness of firebrick to be heated from cold.
D.—Holding curve.
E.—Thermal capacity of steel at various temperatures.
F.—Heat losses in flue gases at various temperatures and analyses.

(*a*) Internal areas:

13½ in. firebrick walls:
Side walls 3.5 × 1.25 × 2 = 8.75 sq. ft.
Back wall 3.5 × 1.5 average = 5.25 sq. ft.
Total = 14.00 sq. ft.

9 in. firebrick, 3 in. insulated arch:

$$\frac{\text{Angle between skewbacks}}{360} \times \text{Circumference} \times \text{Length}$$

$$= \frac{60}{360} \times \frac{22}{7} \times \frac{84}{12} \times \frac{42}{12} = 12.85 \text{ sq. ft.}$$

9 in. firebrick hearth:
3.5 × 3.5 = 12.85 sq. ft.

4½ in. insulated door:
2.75 × 1.375 average = 3.80 sq. ft.

(*b*) Heating from cold:

$$\frac{\text{Lb. firebrick} \times \text{Sp.Ht.} \times \text{Rise in temp.} = \text{cu.ft. gas required.}}{\text{Effective B.Th.U. in gas}}$$

Alternatively, using graphs B, C, and F

$$= \frac{43 \text{ sq. ft.} \times 0.14 \text{ thickness (B)} \times 130 \text{ lb.} \times 480 \text{ B.Th.U./lb (C)}}{220 \text{ (F)}}$$

= 1,708 cu.ft. of gas to heat from 60° F. to 1,832° F.

(*c*) Maintaining 1,000° C. (1,832° F.) with door closed:

(Heat losses taken from "The Efficient Use of Fuel" rather than working them out from first principles, or using graph D.)

13½ in. firebrick—14.0 sq. ft. × 1,300 B.Th.U. = 18,200 B.Th.U.
9 in. firebrick/3 in. insulation—12.85 sq. ft. × 420 B.Th.U. = 5,397 B.Th.U.
9 in. firebrick—12.25 sq. ft. × 1,400 B.Th.U. = 17,150 B.Th.U.
4½ in. insulation—3.8 sq. ft. × 410 B.Th.U. = 1,558 B.Th.U.

Total = 42,305 B.Th.U.

The above is the calculated true radiation when the furnace is at thermal equilibrium, but, as it will be intermittently operated for about 10 hours daily and shut down for night and week-end periods, a factor must be used in relation to the wall structure to allow for the input of sufficient heat to overcome the apparent radiation loss. In this case a figure of 0.6 will be employed, so that the gas required for maintaining will be:

$$\frac{42,305}{0.6 \times 220} = 320 \text{ cu.ft./hr.}$$

(*d*) Heating of steel from 60° F. to 1,000° C.:

$$\text{Gas required} = \frac{896 \text{ lb.} \times 270 \text{ B.Th.U. (E)}}{220 \text{ B.Th.U. (F)}} = 1,054 \text{ cu.ft./hr.}$$

∴ total gas per hour = 1,054 + 320 = 1,374 cu.ft./hr.

To cope with this the burner equipment should be rated at 1,500 cu.ft./hour with a turn-down ratio to 300 cu.ft./hour. This will also cope with the initial heating by allowing 1½ hours on Mondays, and one hour on subsequent working days.

Utilization of Waste Heat

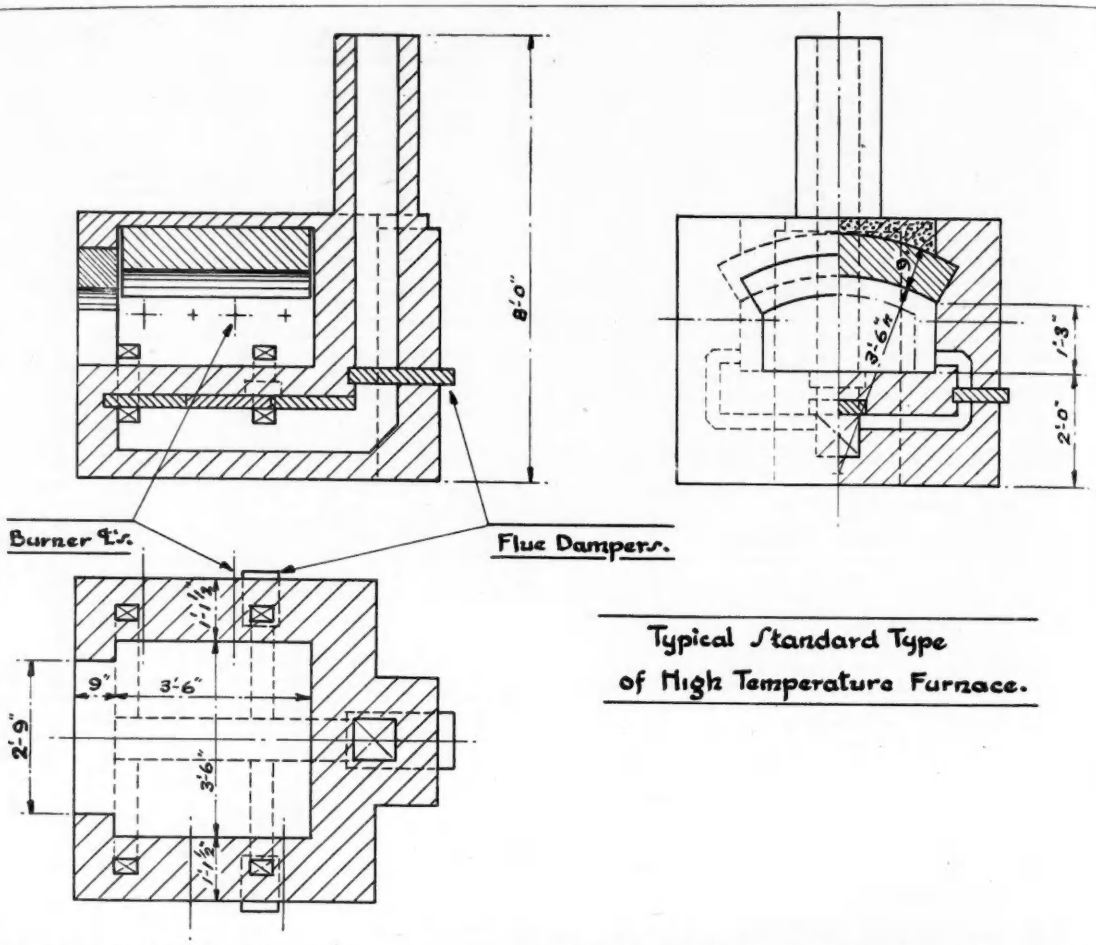
Due to the abundance of low-priced solid fuel in the past century there was little incentive to be other than wasteful in respect of the heat left in the flue gases after leaving the working chamber of the ordinary run of industrial furnaces. In large continuously operated furnaces this available heat was used for preheating of stock, gas, and air, but this was rarely done with batch furnaces operated for intermittent heating periods. With the rise in price of basic fuels, and the decreasing reserves, together with the vital competitive necessity of keeping fuel operating costs at the lowest practicable level, it has now become imperative to make the greatest use of any available waste heat.

For example, with a heating operation at 1,500° F. the flue gases must be of the order of 1,700° F. to maintain 1,500° F. in the working chamber. There is thus available a considerable amount of residual heat which cannot be directly utilized for the primary heating process, but which might be indirectly returned to the working chamber in one form or another. If the initial flame temperature is 3,200° F. more than half the original heat is normally lost in the flue gases. The higher the working temperature the higher the flue gas temperature, and the greater the loss of useful heat to waste. Broadly, thermal efficiencies greater than 30% are unusual in high temperature industrial heating processes, and become lower with the increase of operating temperatures. Attempts to utilize some or all of the 60% of heat wasted in flue products have mainly been limited by the mechanical limitations of the materials or appliances employed.

The heat salvage applications fall under five main headings, as follows:

(*a*) Preheating of the working material.
(*b*) Preheating of gas, air, or both.
(*c*) Recirculation of flue gases.
(*d*) Waste heat steam boilers.
(*e*) Space heating media, air or hot water.

In all the above consideration is given only to the heat available above the dewpoint of the waste gases.



Typical Standard Type of High Temperature Furnace.

Preheating of the Working Material

We have already touched upon this in respect of tool hardening furnaces, but that was more essentially to avoid submitting the material to the high thermal shock that would occur if it was placed when cold into the high temperature heating chamber.

Of the various methods of heat salvage, preheating of the working material is the most effective. The most perfect type of this heat transfer is by means of the counterflow method, in which the materials and hot gases move in opposite directions through the furnace. Examples of this are the continuous tunnel kiln used mainly in the ceramic industries, and the continuous steel billet heating furnaces, where gas is burned at one end of a furnace and flue gases leave at the other end, the working material being admitted at the end where the flue products escape, and travelling to the hottest end at which it is maintained at the appropriate working temperature, prior to withdrawal for manipulation. Where zonal furnaces are used with preheating, soaking, and cooling cycles a counterflow of materials is sometimes arranged to allow the cooling materials to transfer heat to the opposing flow of incoming materials. By use of these continuous-operation methods savings of 25-60% of fuel have been effected, and even here it may be possible to effect further savings by recuperation.

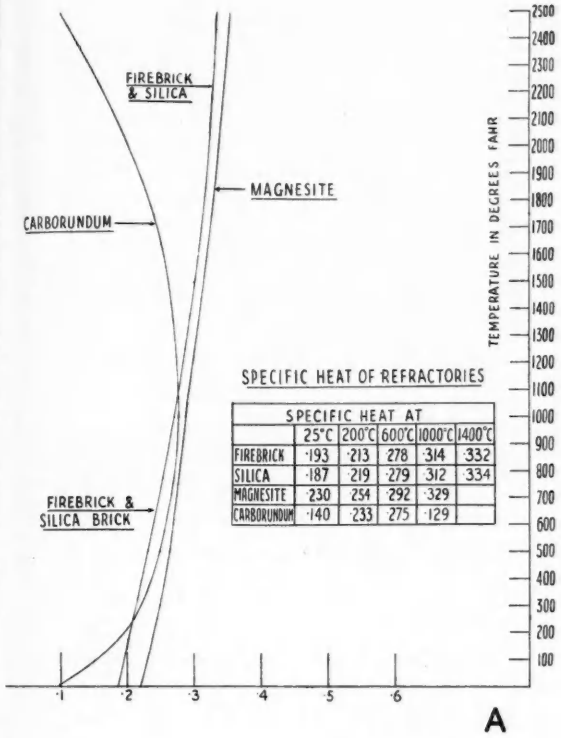
In batch type furnaces it is also possible in some instances to arrange for preheating chambers, but this is bound up with the types of work and temperatures involved.

Preheating of Gas and Air

It is of primary importance to maintain a high temperature gradient between a substance to be heated and the heating medium, and the speed of heating is a direct function of the temperature differential. Thus, if the flame temperature is raised by preheating the air and/or the gas, the heating operations will be completed with greater rapidity, or, conversely, in the same time with lower gas consumption. This increase in flame temperature is the result of two independent effects: firstly, by heating the air for combustion beforehand the heat of combustion will heat the air-gas mixture to a higher temperature than if all the products were originally cold; secondly, it so happens that most chemical reactions proceed with increasing speed as the temperature is raised. Therefore, by starting with preheated air the gas combustion will be more rapid. Consequently, more of the heat of combustion will be liberated in a given time, thus reducing heat losses from the flame and raising the temperature nearer to the theoretical flame temperature. The resultant flame will be shorter than before; and while this is of no particular significance for a number of heating operations, there may be others where it is considered desirable to reproduce the long lambent flames caused by the delayed combustion of lean gases such as producer and blast furnace gases, where the radiant heat from the flames is distributed evenly over the material from the source of heat to the flue gas exit. The benefits of both can possibly be obtained by the introduction of an inert gas like the products of combustion, as it is reasonable to assume that with the short hot flame there may be a comparatively high differential between the furnace temperature local to the flame, and that at the flue gas exit, although this is not in evidence on small or medium furnaces, probably due to the rapid circulation of the hot gases in the working chamber.

The theoretical flame temperature of lean gases may be too low to perform a desired operation, and it is thus more common practice to heat both air and gas with these than with town gas. There appear to be no limits to the temperature to which the air can be satisfactorily heated within those of the temperature available in the flue gases and the efficiency of heat transfer, but it does appear necessary to limit the upper temperature of preheated town gas to a temperature below " cracking point " of the hydrocarbons, otherwise there may be some form of carbon coke precipitation in burners or at burner ports prior to mixing with the air for proper combustion. Lean gases are not affected to anything like the same extent owing to their negligible hydrocarbon content.

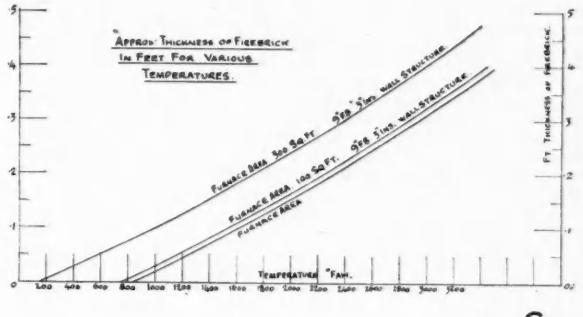
There are two general types of apparatus for preheating, recuperators and regenerators. Each of these has its own particular field of usefulness, but for smaller installations the lower first cost and small size make it advantageous to employ recuperation rather than regeneration. The action of these two methods is widely different. A recuperator consists essentially of a flue gas duct through which passes a set of tubes or passages carrying the cold blast of air. Preheating occurs by the transfer of heat from the hot flue gases through the tube walls to the air on the inside, and by employing counter current flow a large portion of the heat in the flue products will be absorbed by the air. About 85 sq. ft. of recuperator surface are required per mill. B.Th.U. per hour required in a furnace (for useful heat plus radiation plus convection losses). Regenerators, on the other hand, consist of



SPECIFIC HEAT OF REFRACTORIES

	SPECIFIC HEAT AT				
	25°C	200°C	600°C	1000°C	1400°C
FIREBRICK	·193	·213	278	·314	·332
SILICA	·187	219	·279	312	·334
MAGNESITE	230	254	·292	·329	
CARBORUNDUM	·140	·233	275	·129	

A


APPROX THICKNESS OF FIREBRICK IN FEET FOR VARIOUS TEMPERATURES.
FURNACE AREA 500 SQ FT. 9"B 9" WALL STRUCTURE
FURNACE AREA 100 SQ FT. 9"B 9" WALL STRUCTURE
FURNACE AREA
TEMPERATURE °FAH.
FT THICKNESS OF FIREBRICK

C

HOLDING CURVE

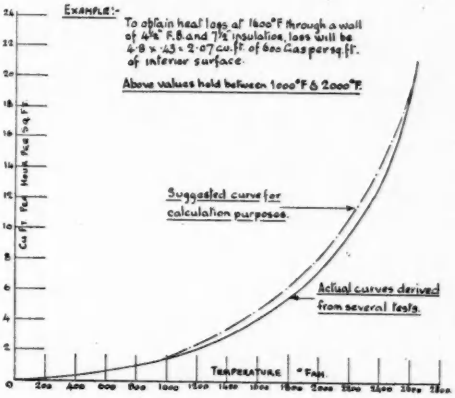
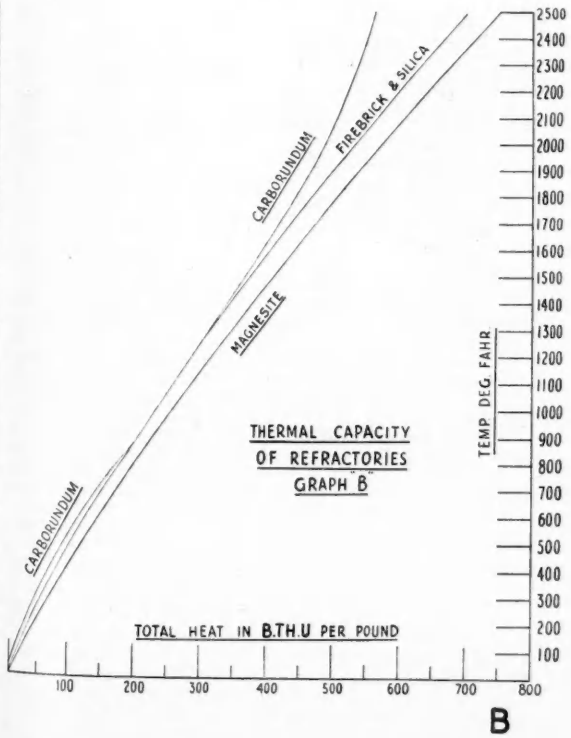

EXAMPLE:-
To obtain heat loss at 1600°F through a wall of 4½" F.B. and 7½ insulation, loss will be 4·8 × ·43 = 2·07 cu. ft. of Gas per sq ft. of inferior surface.
Above values hold between 1000°F & 2000°F.
Suggested curve for calculation purposes.
Actual curves derived from several tests.
TEMPERATURE °FAH.

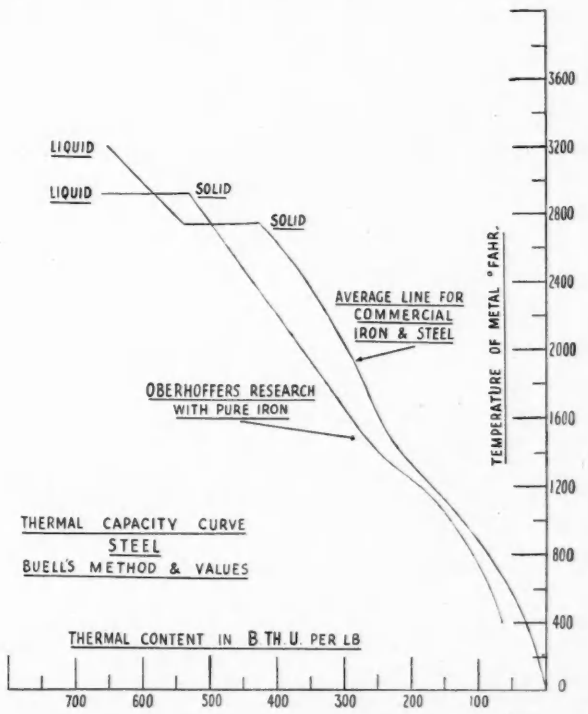
Table of Constants for use with curve.

F.B.	INS.	"K"
4½"	0	2·5
	2½"	1
	5"	62
	7½"	43
	10"	35
9"	0	1·4
	2½"	78
	5"	47
	7½"	37
	10"	31
	12½"	26
13"	0	1
	2½"	63
	5"	30
	7½"	31
	10"	28
18"	0	78
	2½"	44
	5"	34
	10"	27

D



B



E

two large chambers filled with chequer brick work, with an arrangement of butterfly valves or the like, so that flue gases are alternately passed through these chambers, say every 20 to 30 minutes. While the flue gases are heating up the chequer brickwork in one chamber, the air or gas is passing through the other chamber where it cools the hot brickwork as it absorbs the heat en route to the burner ports. At the outlet of these the gas and air meets for combustion, the flame and hot gases giving up heat to the material in the working chamber before being vented to the other regenerator chamber mentioned above. The advantage of regenerators is that they permit high degrees of preheat, but they are bulky and expensive to build and maintain. Some idea of the value of preheating the air is shown by the following data:

Temperature of flue gases entering recuperator, °F.	1,000°	1,400°	1,800°	2,200°
Preheat temperature of air, °F. :				
(a)	200	200	200	200
(b)	400	400	400	400
(c)	600	600	600	600
(d)	800	800	800	800
(e)	—	1,000	1,000	1,000
(f)	—	1,200	1,200	1,200
(g)	—	—	1,400	1,400
Equivalent direct reduction of fuel consumption, per cent. :				
(a)	3	3.2	3.8	5.0
(b)	7	8.0	9.2	11.0
(c)	11	12.5	14.0	17.0
(d)	15	16.0	18.5	22.0
(e)	—	20.0	22.5	26.5
(f)	—	23.5	26.5	30.5
(g)	—	—	29.5	34.0

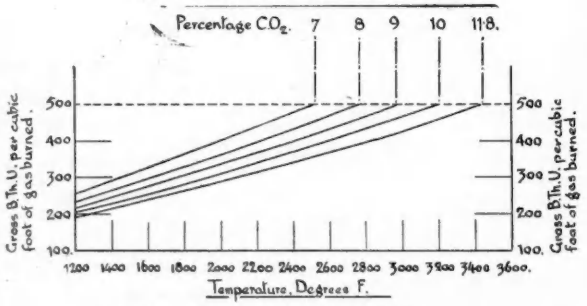
There is an additional saving due to the reduction of scale formation at high temperatures when preheating is used. As has already been shown, scale is a form of oxidation, and at temperatures above 1,550° F. (850° C.) this is due to the action upon the heated steel of both free oxygen in the furnace, and the dissociation of carbon-dioxide and water vapour, which are the products of perfect combustion of carbon and hydrogen, into their component elements, with the liberation of free oxygen. As heated air has a markedly greater combining power than cold air the quantity of free oxygen in the furnace gases is greatly reduced by recuperation.

Normal scale loss varies between 2-4% of the metal heated, 2½% being the average figure for forging work. The cost of this scale loss is an expensive item both in material lost and the cost of work put into the steel prior to the scale loss, and it is estimated that recuperation can reduce this loss by an average of 20%, which represents a substantial saving in both steel and fuel used over a year's working.

Recirculation of Flue Gases

This method of heat recovery is most frequently used in the case of dryers and air heaters. The principal reason for the introduction of flue gases into such dryers is not for heat salvage so much as because drying speeds are improved when special humidity conditions are maintained, as in large core drying ovens. Another application is in large working chambers operating at low temperatures, say about 300° C., particularly for long periods and with large unit masses of material, where the low volume rate per hour of the air/gas mixture required for maintaining the material at this low temperature might cause uneven heating of the mass, or local "stripe heating" which can be overcome by forced circulation of an admixture of this volume with an appropriate volume of waste gases. The amount of heat saved depends on the proportion of recirculation, which might be anything between 10-50% of the total flue gas volume.

Approximate Heat in Flue Products for Various CO_2 Analyses (Based on 500 C.V. Gas.)



Example:- Furnace Temperature 1800° F.
Analyses of flue products showing 10% CO_2.

Calculations:- a. Find point of intersection of 1800° F. vertical line, & 10% CO_2 line.
b. Read off the relative loss of heat in flue products on vertical scale.
c. Deduct the above reading from gross B.Th.U. value of gas & the resulting figure is the heat per cubic foot of gas burned in the furnace which is available for heating the work.
d. At 1800° F the vertical line strikes the 10% CO_2 line at a point which gives a reading of 280 B.Th.U. This leaves 220 B.Th.U. per cubic foot of gas for heating articles placed in the furnace. It is also the figure used in the heating-up & holding calculations.

F

Useful Furnace Data.

Thermal Conductivity Of Some Refractory & Insulating Materials.

This Is Expressed As "k" Or B.Th.U's/Sq.Ft/Hr/°F/Inch, Varying With Different Materials And The Mean Operating Temperature, i.e. The Arithmetic Mean Between The Hot And Cool Face Temperatures.

Characteristic	Firebrick.			Alumina	Silica.		Average Magnesite	Si. C. 90%	Silicon Carbide.		
				70% Al_2O_3	81% Al_2O_3	96% SiO_2	93% SiO_2		Si. C 77%	Si. C 57%	Si. C 49%
Burning Temp. °C.	1300	1400	1460	1420	1450	1460	1460	1435.	1310	1300	1310
"k" At 300°C.	6·13	7·30	8·35	7·25	10·35	9·38	8·16		90	42	33
500°C.	6·76	7·76	8·92	7·10	15·32	10·12	9·02	24·9	108	80	40	32
700°C.	7·25	8·11	9·30	6·92	14·8	10·84	9·76	20·6	90	71	39	30
900°C.	7·50	8·31	9·48	6·77	14·53	11·38	10·43	17·4	77	63	34	28·5
1100°C.	7·61	8·43	9·56	6·60	14·48	12·28	11·08	14·8	69	55	31	27

Insulating Bricks Over The Mean Range 0°C To:-

Type Of Insulation	200°C	400°C	600°C	800°C
Insulating Firebricks	1·74	1·89	2·03	2·18
Porous Diatomaceous Bricks	0·73	0·81	0·90	1·02
Solid " "	1·07	1·20	1·36	1·45

Table Showing Wall Junction Temperatures And Heat Losses For Different Wall Structures.

Thickness Of		Temperature Of The Hot Face In °C.									
Firebrick In Inches	Insulation In Inches	1400	1200	1000	800	600	1400	1200	1000	800	600
		Wall Junction Temperature In °C					Heat Loss In B.Th.U's/Sq Ft/Hour				
4½	–	420	350	310	250	190	5400	3600	2850	2000	1130
4½	4½	1235	1060	880	705	530	670	530	410	300	210
9	–	280	240	200	160	125	2400	1850	1400	830	540
9	2½	990	850	710	570	430	790	620	460	330	230
9	4½	1120	960	800	640	480	560	420	320	230	170
9	9	1240	1065	890	710	535	320	240	190	150	100
13½	–	260	220	190	150	120	2150	1600	1300	740	530
13½	4½	1020	880	735	590	440	480	360	270	210	160
18	–	180	150	130	110	90	1030	750	600	460	340
18	4½	950	815	680	550	410	420	330	260	200	150
18	9	1120	960	800	640	485	280	220	180	140	100

Table Showing Ratio Of Calculated Heat Losses From A Furnace At Saturated Wall Temperature To Apparent Radiation Losses From A Furnace Intermittently Used

Thickness Of		Operating Period In Hours		
Firebrick	Insulation	10	20	60
4½	0	1·00	1·00	1·00
	10	0·23	0·25	0·39
9	0	0·90	0·90	1·00
	5	0·30	0·33	0·50
	10	0·20	0·21	0·26
13½	0	0·62	0·67	0·90
	5	0·23	0·25	0·35
18	0	0·50	0·53	0·67
	5	0·22	0·23	0·28

The Calculated Heat Losses Should Be Multiplied By The Appropriate Factor For The Wall Structure And Operating Period. For Variations From The Data A Suitable Factor Can Be Derived By Interpolation.

Waste Heat Steam Boilers

The advantage of this system is dependent on the continuous operation of the furnace or other source of hot flue gases together with an equally continuous demand for the steam produced. The latter is not so important as the former, as a portion of the waste heat can easily be by-passed to the chimney stack. In general practice the boot is usually on the other foot, as the source of heat may be intermittent requiring the installation of auxiliary fuel burners to cover this contingency, and the initial steam raising.

Space Heating Media—Air or Hot Water

This is really another alternative to the above, which may be applicable in certain instances, and should therefore be borne in mind. There may well be hot water heating boilers or a demand for hot air heating which could be served by this means if centralized near to this source of heat.

Bibliography

Acknowledgments to Sources of Information
"Combustion," American Gas Association.
"Immersion Heating of Liquids," C. S. Segeler.
"Heat Transfer," A. I. Brown (Professor of Mechanical Engineering, Ohio State University, Columbus, Ohio).
"Industrial Furnaces," W. Trinks.
"The Efficient Use of Fuel," Ministry of Fuel and Power Handbook. (H.M. Stationery Office.)

Books for Further Study
"Combustion," American Gas Association.
"Flow of Gases in Furnaces," Groume-Grjimailo.
"Furnace Heating," R. J. Sargant.
"Industrial Furnaces," W. Trinks (1944 revision, Volume II).
"The Efficient Use of Fuel," Ministry of Fuel and Power Handbook. (H.M. Stationery Office.)

APPENDIX

Data in Respect of Example No. 1

Heat Transferred to the Room Atmosphere from the Water Surface of Uncovered Tanks

Water temperature °F.	Room temperature, 60° F.* Heat transferred to room atmosphere, B.Th.U./hr./sq. ft. Evaporation loss	Heat radiated to room atmosphere*	Total heat loss
90	80	50	130
100	160	70	230
110	240	90	330
120	360	110	470
130	480	135	615
140	660	160	820
150	860	180	1,040
160	1,100	210	1,310
170	1,380	235	1,615
180	1,740	260	2,000
190	2,160	290	2,450
200	2,680	320	3,000
210	3,240	350	3,590
220	4,000	380	4,380

Heat Transferred to Room Atmosphere from Tank Walls

Water temperature °F.	Heat loss to room, B.Th.U./hr.sq ft. of wall area Bare tank walls	Insulated Tank 1 in. thick	Tank 2 in. thick	Walls 3 in. thick
90	50	12	6	4
100	70	15	8	6
110	90	19	10	7
120	110	23	12	9
130	135	27	14	10
140	160	31	17	12
150	180	34	18	13
160	210	38	21	15
170	235	42	23	16
180	260	46	25	17
190	290	50	27	19
200	320	53	29	20
210	350	57	31	22
220	380	61	33	23

* For other room temperatures multiply the values given in table by the fraction $\frac{60}{\text{Room temp.}}$

BRIEF NOTES ON THE DESIGN OF THE FURNACE INDICATED IN EXAMPLE NO. 2

Data Required

Type of metal to be treated.
Size of metal to be treated per unit piece.
Weight of metal to be treated per unit piece.
Weight of metal to be treated per hour.
Working temperature range.
Furnace atmosphere.
Type of charge and discharge.
Knowledge of general production operations.

General Design

(1) *Working Hearth Space*

From an assessment of the weight per hour of material to be heated to a defined temperature, the dimensions of each unit piece, and the time required adequately to heat each unit piece in readiness for processing, the effective width and length of the furnace hearth can be defined. The load per square foot of hearth area should be within the limits of good practice. For example, with iron and steel it should be as follows:

Heat treatment—Up to 30 lb./sq. ft./hr.
Annealing—Up to 60 lb./sq. ft./hr.
Forging—Up to 80 lb./sq. ft./hr.
Continuous furnaces—From 50-100 lb./sq. ft./hr. (dependent on thickness of material).

(2) *Total Hearth Space*

The actual internal hearth width should not be less than 6 in. wider than the door width, rising to 9 in. for large furnaces. The main side walls will thus be set back 3 in. to 4½ in. on each side from the door width. The length of the hearth, beyond the depth of the door opening, should be 6 in. to 9 in. greater than that required for the longest piece of material to be heated, so ensuring that all work will be exposed to the full even heat of the furnace.

(3) *Door Space*

The door opening should be reasonably greater than that required for clearing the over-all dimensions of the largest article to be heated, the actual amount of opening required for any one article being regulated by the height of door lift. The final door opening space is arranged by compromise between the height allowed for the door opening side walls and the rise of the door relieving arch. The door width should be the same as the effective hearth width, and the sill height be appropriate to the type of product being handled, varying from 2 ft. above floor level for heavy forgings to 3 ft. 9 in. for light articles such as rivets. The door itself should be lined with insulating brick, with a few firebricks interposed at the sides to take the abrasion which must occur during lifting or closing operations. The door should be well balanced and arranged to pull rapidly off the furnace front brickwork when lifted, to prevent undue abrasion. On heavy doors the overhead pulley shaft should be mounted on ball bearings. The opening in the cast iron front plate should be sufficient to allow a 3 in. face of furnace brickwork to be brought flush with the front of the cast iron plate, to enable the door to be sealed in the closed position

(4) *Main Side Walls*

The internal side walls should be carried to a sufficient height to allow the main arch to be 3 in. to 6 in. higher than the door relieving arch, according to the size of furnace. Allowance should be made for tiling over openings left in the brickwork for lighting holes, burner blocks, or burner tunnels, as the skewbacks must rest on a flat base.

(5) *Main Arch*

Within the range of normal furnaces a safe guide for the arch radius is to make this equivalent to the distance between the side walls from which the arch is sprung. The same radius can be used for a reverberatory arch, but in this case the centre line should be one quarter of the distance between side walls, and nearer to the side wall in which the burners will be fixed, this being the higher side wall. When completed, the arch should be covered with either insulation or sand. A longitudinal expansion allowance of ⅛ in. per foot run is good general practice—*i.e.*, in a 12 ft. length a gap of ¾ in. is left at each end. It will thus be seen that the main arch floats freely on the skewbacks, and there is no restriction on its expansion and contraction.

(6) *Flues*

Dependent on the size and type of furnace, the flue ports can be divided equally along the side walls, one course above hearth level, with two major outlets at the front, either in the door opening side walls, or on the hearth at the sides just inside the furnace proper. Alternatively, all the gases can be flued directly through the hearth, the auxiliary ports being equally spaced on each side of the hearth at the base of the side walls. In each case the ports can be led to a common underhearth duct en route to a chimney stack of suitable height. The object of collecting the bulk of the waste gases at ports adjacent to the door opening is to balance the heat losses, which are greatest at this point, so tending towards uniformity of heating throughout the furnace, and also to prevent the possibility of cold air affecting the stock when the door is lifted. With large or long furnaces having a number of flue ports, it is advisable to arrange for an independent firebrick tile damper at each port, so that adjustments can be made to ensure even heating throughout the furnace. The aggregate flue area should not at any point be less than 1 sq. in. for each 20 cu.ft. of gas burned per hour with natural draught burners, or 50 cu.ft. of gas per hour with air-blast or pressure gas burners, calculated on the maximum gas rate per hour.

(7) *Wall Structure*

The thickness of the firebrick lining, and the composition of the wall structure are dependent on several factors, such as the maximum working temperature required, the size of the furnace, the desire for robust construction with low maintenance costs, the type of exterior framework, and whether the operation is to be continuous or intermittent. This is a matter of experience and judgment, but it is better to err on the safe side, allowing solidity of structure to be favoured against estimated academic fuel savings to be gained during initial heating periods. Any prime saving in the cost of firebricks can soon be lost through the incidence of more frequent repairs, and the loss of production at such times.

(8) *Chimney*

The final body of flue gases can be led to an existing chimney, if available, but care should be taken to ensure that there is adequate damper control, and it is helpful if the pull can be broken beyond the damper, to balance any difference in draught due to barometric variations. It is better practice, however, to build a separate small chimney for each furnace of sufficient height to evacuate the flue gases from the below-hearth duct, leaving balanced pressure conditions at hearth level when all burners are full on and the door is closed. At any gas rate below this, the conditions can be reproduced by control of the main damper, which is usually arranged at the base of the chimney.

(9) *Foundations*

Where a furnace is built on a prepared foundation, this should be of ample thickness and area, being extended not less than 9 in. beyond the outside face of all buckstays in order to take the thrust of the "heel" of the buckstays. Thus, the actual width and length of the foundation can only be arrived at by development of the design from the calculated hearth dimensions outwards. Provision must be arranged in the hearth construction for sufficient insulation to be incorporated to prevent heat transmission to the concrete foundation, otherwise this will crack and may cause derangement of the whole furnace.

(10) *Framework*

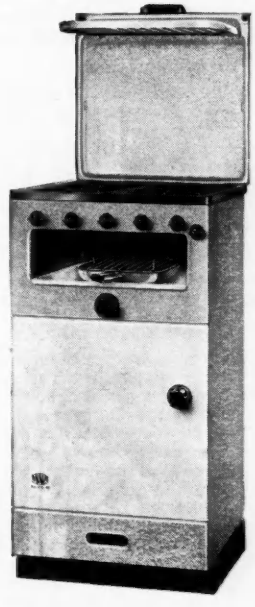
Small and medium furnaces can be enclosed in cast iron or mild steel fabricated cases. With larger furnaces the usual practice is to arrange longitudinal M.S. channels on each side at the appropriate height to take the side-thrust of the main arch, with other similar members below these to which the burners can be rigidly fixed. This steelwork is held in position by a number of buckstays on each side, connected at the top by lateral tie bolts, and grouted into the foundations at their bottom ends. Similar framework is erected against the back wall of the furnace, and the front wall, or door end, usually consists of cast iron plates to allow for ease of formulating the required door opening space, backed by buckstays fixed clear of the door

MAIN 177 GAS

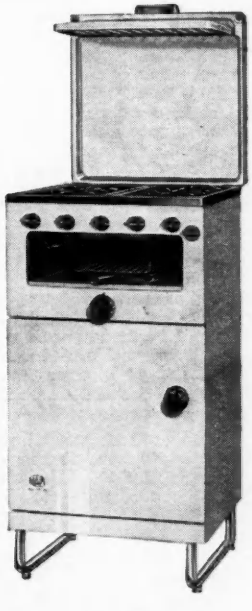
the 177 Cooker offers yet another practical feature

Here is the answer for consumers who like a cooker with a cover to close down occasionally . . . easily operated, rigidly built, and with a neat shelf that folds flat inside . . . the whole thing can be raised or lowered in a matter of seconds, and a patent locking device checks any possibility of the cover closing accidentally.

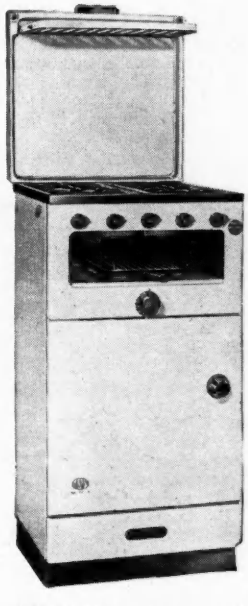
This new 177 feature is available with the standard model in dapple grey finish . . . on the deluxe cooker it is finished in cream.



177 with hinged cover and shelf; 4 boiling burner hotplate; 16″ oven; plinth base; dapple/white finish.



177 with hinged cover and shelf; 4 boiling burner hotplate; 16″ oven; tubular legs; cream finish.



177 with hinged cover and shelf; 4 boiling burner hotplate; 16″ oven; plinth base; cream/black finish.

177 with hinged cover closed; 3 boiling burner hotplate; 14″ oven; cast iron legs; dapple/white finish.

CHOICE OF 177 FEATURES

Platerack and backplate, or short splashplate . . . Hinged cover with shelf . . . Oven heights: 14″ or 16″. (Portal, 14″ only) . . . Hotplates with 3 or 4 boiling burners and a high-speed grill . . . Cast iron legs, plinth base or tubular legs . . . finishes are in dapple/white, or cream/black.

COOKER

with a choice of interchangeable features

R. & A. MAIN LIMITED · LONDON and FALKIRK

arrangements. These front buckstays are connected to the back buckstays by longitudinal tie bolts. All tie bolts should be spring loaded to give the flexibility necessary for the "breathing" of the firebrick structure during heating and cooling periods.

(11) *Gas Consumptions*

A consumer usually requests a series of consumption figures—*e.g.*, the amount of gas required to bring the furnace to working temperature from cold; the equivalent figure when the furnace has been in full operation the previous day; the consumption when maintaining at working temperature with the furnace empty and door closed; the consumptions when under various production conditions. The last item is usually a singular one, such as—"the consumption to heat 1 ton of mild steel per hour to 1,000° C."—but there may be a request covering also 15 cwt. and 10 cwt. per hour. Some of these figures have to be calculated in any case, in order to ascertain the maximum gas demand per hour, and so assess the type, rating, and disposition of the burners and burner equipment.

(12) *Burner Equipment*

The particular type of burner equipment to be employed should be defined in relation to the range of working temperatures required in the furnace under review, the control of furnace atmosphere, the quantity and rate of heat input required, and the application of automatic controls (where desired). Up to a certain point this can be met with natural draught burners, which normally require a special arrangement of the underhearth firebrick structure for the secondary air preheating ports and combustion zones. This is satisfactory for low temperature furnaces having lightly loaded hearths, mostly with relatively low gas rates and slow speeds of heating. A large range of industrial furnaces, however, is required for heavy loading at high temperature, combined with high speed of heating and production. For this it is necessary to use burner equipment capable of high rates of heat input. This is usually of the semi-automatic type with air supplied at a pressure of about 1 lb. per sq. in. and gas at normal town pressure, or gas at a pressure of about 5 lb. per sq. in., with air automatically entrained in relation to the velocity of the gas at each burner jet.

(13) *Flues*

A safe allowance for primary flue ports is 1 sq. in. for each 50 cu.ft. of gas burned per hour. Thus, the total flue area $= \frac{2,000}{50} = 40$ sq. in. To give a correct balance in the furnace arrange four flues, each 4½ in. wide by 3 in. high, two on each side. One flue on each side should be arranged close to the inside face of the front wall, and there should be a further flue on each side about three-quarters down the side walls, the two back flues having check dampers.

The underhearth main flue and the chimney areas must be in excess of the total area of the furnace flue outlets. Therefore allow these to be 9 in. by 9 in., and incorporate a main damper in the base of the chimney.

The chimney height should be such that the dimension from hearth level to top of chimney is not less than three times the dimension from hearth level to bottom of main flue (below hearth). This should give sufficient draught to evacuate the flue gases and give balanced pressure conditions in the furnace, but it is an easy matter to add a few courses of brickwork to the chimney if more draught is considered advisable. In this instance the dimension from hearth level to base of main flue is 1 ft. 6 in., and from hearth level to floor is 2 ft., so that the total height of stack from floor level should not be less than (3 ft. × 1 ft. 6 in.) + 2 ft. = 6 ft. 6 in., say 8 ft. stack.

Furnaces of this type are usually placed in large shops where the flue gases are free to dissipate in the roof space without inconvenience or discomfort to operatives. If, however, it is considered necessary to vent them from the shop the orthodox method is to use circular sheet metal or mild steel extension chimneys, which should be carried through the roofing material in such a manner that no heat can be transmitted to this material and no surface water leak through the roof joint. The base of this extension should be bell-mouthed, and not connected directly to the brick stack, otherwise the additional and variable chimney draught would adversely affect the operation of the furnace.

GAS UNDERTAKINGS' RESULTS

Bilston Gas Light and Coke Company

Profit for the year ended Sept. 30, 1948, was £16,225, compared with £20,255 for the previous year. Final dividends of 5s. 1½d. per share on the "A" ordinary shares and 3s. 7½d. per share on the "B" ordinary shares, less tax, leave a balance of £10,587 to be carried forward, against £10,309 brought in. Gas sales during the year exceeded all previous records and there were big increases in the demand for gas for industrial purposes and for new houses erected in the area of supply. Extensions to the carbonizing plant will be started in the near future and the Ministry of Fuel and Power has authorized further extensions required to meet demands for gas required by local industry and for domestic purposes in proposed local developments.

Colonial Gas Association

The net profit for the year ended June 30, 1948, after providing £27,000 for taxation, was £90,360, a return of 5.17% on the average of shareholders' funds. Gas sales increased in the Association's works by 9% and in subsidiary companies by 5.7%. Important extensions of plant carried out include an addition to the vertical retort installation and the provision of new purifiers at the Box Hill Works. Manufacture of gas at Frankston ceased during the year and the Frankston load and part of the Oakleigh load are now carried by the manufacturing plant at Box Hill. In his address to the shareholders at the 60th annual general meeting, at which an ordinary dividend of 5% was declared, Mr. C. F. Broadhead, Chairman, said it was with regret that the Directors decided that the position did not warrant the restoration of the dividend to 6%. The position of shareholders whose income was derived from investment was appreciated and it was realized that the heavy income tax on property income and the rising costs of commodities and services fell heavily on shareholders' incomes. Also it would be to the Company's advantage in raising capital if the ordinary dividend were at a higher rate, but he assured the proprietors that the matter had received most careful consideration.

The Drayton-Hays Gauge

We have received particulars of the Drayton-Hays gauge for draught measurement employed on a tunnel kiln, designed and built by Gibbons Bros., Ltd., Dudley, for ceramic firing. To ensure an even temperature across any section of the tunnel, it is necessary to have the same pressure in each side flue; in the case of a gas-fired muffle kiln, this pressure is generally from 0.02 to 0.03 in. water gauge draught. In this tunnel kiln it was decided to incorporate the Drayton-Hays gauge. It has proved successful, and we understand that Gibbons Bros., Ltd., have adopted it as standard on all their tunnel kilns.

Drayton-Hays gauges indicate draught, or negative pressure, in the side flues of a tunnel kiln, along which hot gases from the burners pass. Adjustment of draught is made by altering the settings of the side flue dampers in that portion of the kiln just before the flues enter a common duct on the suction side of the induced draught fan. One gauge is used with a two-way changeover cock to each side flue. Drayton-Hays gauges are also used for indicating draught in the open flame type of tunnel kiln.

The Fire Protection Association, 84, Queen Street, E.C.4, has published a booklet, *Fire Protection Notes for Storage Buildings*, which may be obtained free of charge by industrialists. The booklet emphasizes the importance of storage arrangements being such as to minimize the likelihood of fire damage, gives general guiding principles, advice on sub-divisions, protection of steelwork, and the segregation of commodities.

GAS STOCKS AND SHARES

Markings last week at 35,739 compared very favourably with the preceding few weeks and the total has not been exceeded since the week ended Nov. 18. On the whole, however, it was a quiet, irregular week with the political situation in the Middle East causing weakness and Wall Street having little encouragement to offer. Dealings in gas shares remained steady with an average of 38 dealings per day bringing the week's total to 191. A number of shares changed hands at a slightly increased price—details are given below.

Some improvement in Stock Exchange activity was envisaged as a result of the Chancellor of the Exchequer's announcement at a Press conference regarding Britain's progress towards achieving a trade balance, but activity was expected to be cautious in view of Sir Stafford's statement that dividend limitation was to be continued. British Funds showed the greatest activity at the close of the week when the *Financial Times* index gained 0.08 after remaining steady for two days. The industrial markets were quieter than of late and movements were usually moderate and mixed.

OFFICIAL LIST

	Defd.		
Assed. Gas & Water U'd'tgs.		22/9—23/9	+ 3d.
Gas Light & Coke, Ord. ...	...	23/ —24/	+ 3d.
Hastings & St. L. (3½ p. c. Std.)...		87 — 92	+ 7
Imperial Continental Cap.	...	110 —115	— 1
Primitiva Holdings, Ltd., Ord. ...		9/— 11/	+ 6d.
Reading 3½ p.c. (Non-Cum.) Pref.		96 —101	+ 2

The name of the Staveley Coal and Iron Co., Ltd., has been changed to the Staveley Iron and Chemical Co., Ltd.

Shell-Mex and B.P., Ltd., announce a reduction of ½d. per gall. (approximately 10s. per ton) in the prices of their fuel oil and heavy fuel oil for industrial purposes in the United Kingdom. This follows the recent decline in the world market price for heavy fuel oil in the U.S. Gulf.